407 - 444

THAMES RIVER BASIN

KILLINGLY, CONNECTICUT

ELMVILLE DAM

CT 00165

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

OCTOBER, 1979

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Thames River Basin
Killingly, Conn.
Elmville Dam

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Elmville Dam is a composite masonry and earth dam consisting of an unmortared stone overflow section and an earth fill right abutment dike, with an abandoned diversion canal and gate at the right end of the dike. The entire length of the dam is about 200 ft. The dam is judged to be in generally fair condition. The recommended test flood ranges from 100-year to a ½ PMF. A test flood equal to the ½ PMF was selected.

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DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02154

REPLY TO
ATTENTION OF
NEDED

FEB 13 1980

Honorable Ella T. Grasso
Governor of the State of Connecticut
State Capitol
Hartford, Connecticut 06115

Dear Governor Grasso:

Inclosed is a copy of the Elmville Dam Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. This report is presented for your use and is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. A brief assessment is included at the beginning of the report. I have approved the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is a vitally important part of this program.

A copy of this report has been forwarded to the Department of Environmental Protection, the cooperating agency for the State of Connecticut. In addition, a copy of the report has also been furnished the owner, Morris Fisher & Sons, Putnam, Connecticut.

Copies of this report will be made available to the public, upon request, by this office under the Freedom of Information Act. In the case of this report the release date will be thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Department of Environmental Protection for your cooperation in carrying out this program.

Sincerely,

MAX B. SCHEIDER
Colonel, Corps of Engineers
Division Engineer

Incl
As stated

ELMVILLE DAM

CT 00165

THAMES RIVER BASIN
KILLINGLY, CONNECTICUT

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

NATIONAL DAM INSPECTION PROGRAM

PHASE I INSPECTION REPORT

Identification No.:	CT 00165
Name of Dam:	Elmville Dam
Town:	Killingly
County and State:	Windham County, Connecticut
Stream:	Whetstone Brook
Date of Inspection:	21 August 1979

BRIEF ASSESSMENT

Elmville Dam is a composite masonry and earth dam consisting of an unmortared stone overflow section and an earth fill right abutment dike, with an abandoned diversion canal and gate at the right end of the dike. The entire length of the dam is about 200 ft. It is a run-of-the-river dam which once served the industrial needs of a mill that was located downstream. The mill no longer exists and the dam now serves no useful purpose.

The reservoir is about 800 ft. long and has a surface area at spillway level of about 1.8 acres. The drainage area above the dam is about 14 sq. mi. and the maximum storage to the top of dam is estimated at about 26 acre-ft. The height of the dam is 31 ft.; the size classification is thus small. A sudden breach of the dam could cause the loss of a few lives and result in appreciable community and industrial economic losses. The dam has been classified as having a significant hazard potential.

The dam is judged to be in generally fair condition. There is no low level outlet. There is considerable tree growth on the dike, which has no riprap protection on the upstream slope. The right training wall does not adequately retain the end of the dike and sloughing has occurred in this area. A sewer line has recently been constructed through the earth dike at midspan and it appears that no seepage cutoffs were installed along the sewer. The canal passing through the right abutment dike is obstructed with demolition debris and the gate at its entrance is not operative.

Based upon the guidelines, the recommended test flood ranges from 100-year to a ½ PMF. A test flood equal to the ½ PMF (10,800 cfs) was selected. Since storage is insignificant, a test flood routing was not performed.

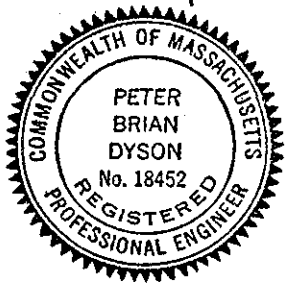
The spillway is not adequate to pass the test flood outflow without overtopping the non-overflow section of the dam. The test flood outflow would overtop the low point in the dike by about 5.4 ft. The spillway can pass 3,000 cfs or about 28 percent of the test flood outflow without overtopping the left end of the dike.

Within one year after receipt of this Phase I Inspection Report, the owner, Morris Fisher & Sons, should retain the services of a registered professional engineer and implement the results of his evaluation of the following:
(1) assess further the potential for overtopping and the adequacy of the

spillway; (2) evaluate the need for providing a means to safely drain the pond; (3) evaluate the impact on dam integrity of the construction of the 20 in. dia. cast iron sewer through the dam; (4) evaluate the need for rip-rap protection on the upstream face of the dam; (5) evaluate the engineering implications of restoring the overflow channel and gate structure to an operating condition; and (6) evaluate the need for repairing of the right abutment wall to prevent sloughing of the dike.

The owner should also implement the following operating and maintenance measures: (1) clear growth from the right abutment dike; (2) restore worn pathways and loss of ground at embankment crest; (3) monitor once per month the zone of possible seepage at toe of right embankment, 75 ft. north of the overflow section; (4) institute procedures for an annual periodic technical inspection of the dam, dike, and appurtenant works; and (5) develop a formal surveillance and flood warning plan, including round-the-clock monitoring during heavy rainfall.

Peter B. Dyson
Project Manager



This Phase I Inspection Report on Elmville Dam has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgment and practice, and is hereby submitted for approval.

ARAMAST MAHTESIAN, MEMBER
Foundation & Materials Branch
Engineering Division

CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division

RICHARD DIBUONO, CHAIRMAN
Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:

JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation: however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

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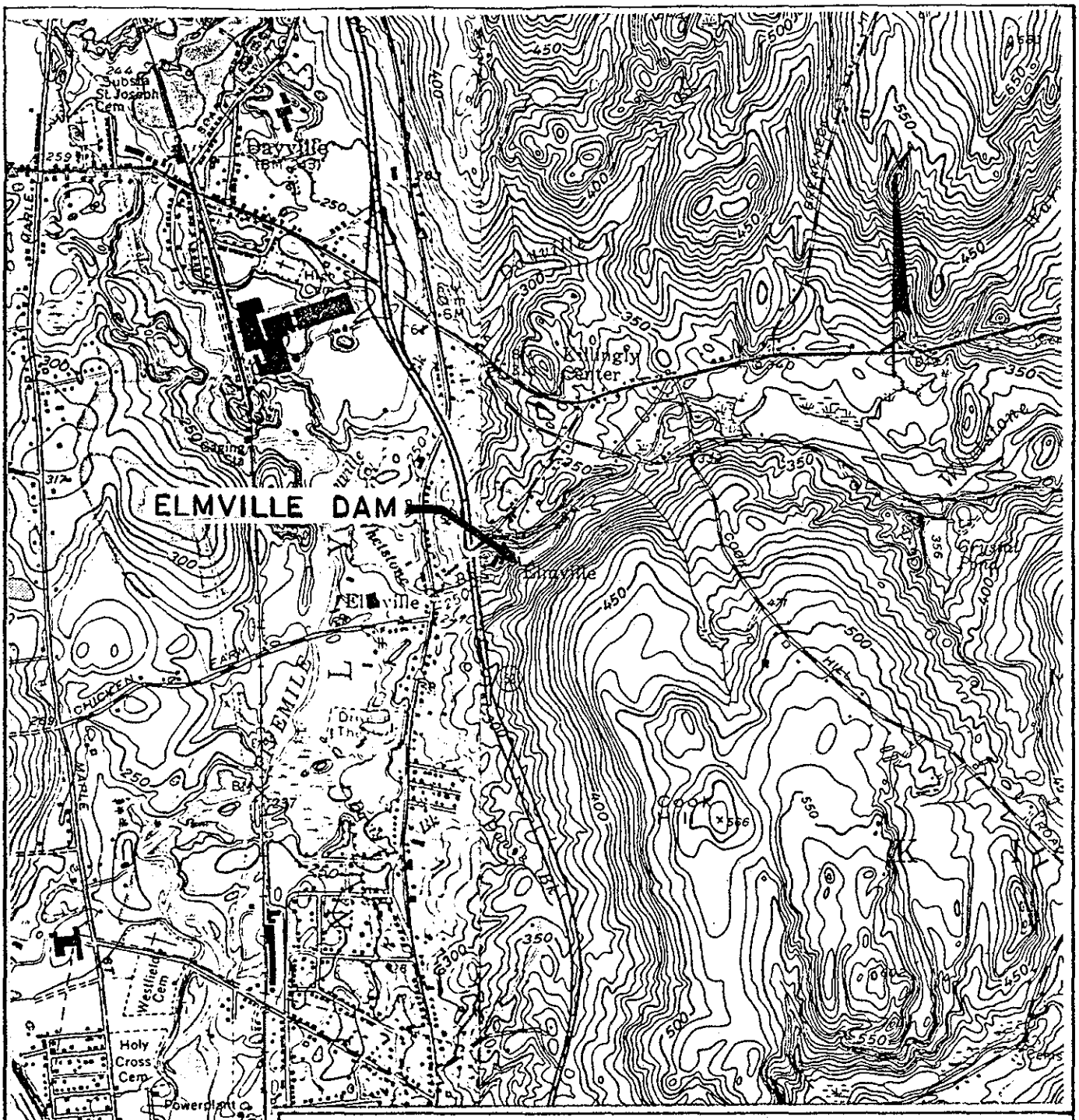
APPENDIXES

Overview from upstream, showing overflow section left, earth dike right.

Overview of overflow section from downstream.



LOUIS BERGER & ASSOC., INC WELLESLEY, MASS. ARCHITECT - ENGINEER	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

ELMVILLE DAM

EAST KILLINGLY, CONN.-R.I. QUADRANGLE

THAMES RIVER BASIN STATE - CT.

			SCALE 1:24000
			DATE

PHASE I INSPECTION REPORT

ELMVILLE DAM CT 00165

SECTION 1 - PROJECT INFORMATION

1.1 General

a. Authority. Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a national program of Dam inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Louis Berger & Associates, Inc. has been retained by the New England Division to inspect and report on selected dams in the State of Connecticut. Authorization and notice to proceed was issued to Louis Berger & Associates, Inc. under a letter of 14 August 1979 from William E. Hodgson, Jr., Colonel, Corps of Engineers. Contract No. DACW33-79-C-0051, Job Change No. 1, has been assigned by the Corps of Engineers for this work.

b. Purpose

(1) Perform technical inspection and evaluation of non-Federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-Federal interests.

(2) Encourage and assist the States to initiate quickly effective dam safety programs for non-Federal dams.

(3) Update, verify and complete the National Inventory of Dams.

1.2 Description of Project

a. Location. Elmville Dam is located on Whetstone Brook about 0.7 mile upstream from the brook's confluence with the Fivemile River. The damsite is in the community of Elmville, in the town of Killingly, Windham County, Connecticut. The dam is reached via Cat Hollow Road off State Route 12. It is shown on U.S.G.S. Quadrangle, East Killingly, Connecticut - Rhode Island with coordinates approximately at N 41° 49' 57", W 71° 52' 57".

b. Description of Dam and Appurtenances. Elmville Dam is a run-of-the-river dam believed to have been constructed around 1900 as a diversion dam to serve a downstream mill complex.

Essentially the dam consists of a masonry overflow gravity section adjoining the left abutment, a wooden gate structure at the head of the diversion canal on the right abutment, and an earth dike between these two structures. The overflow section, about 90 ft. long and 26 ft. high from the streambed to the crest, is constructed of laid up stones with unmortared joints and voids.

The downstream face is vertical. To the left of the overflow section is a short abutment constructed of masonry which rises about 6 ft. above the crest of the overflow section. The right part of the dam consists of an earth fill dike about 110 ft. long and 15 ft. wide at its crest. The upstream and downstream slopes of the dike vary between about 1½ and 2 horizontal to 1 vertical. At the left end of the dike is a stone wall which rises about 5 ft. above the crest of the overflow section. The highest point of the dike is about 7.5 ft. above the crest of the overflow section. On the right end of the dike is an abandoned diversion canal, controlled by a wooden gate, which leads from the ponded water to the site of the old mill, now razed.

c. Size Classification. Elmville Dam is about 31 ft. high, and impounds a normal storage of about 14.6 acre-ft. to spillway crest level and a maximum storage of about 26.0 acre-ft. to the top of dam. In accordance with size and capacity criteria given in Recommended Guidelines for Safety Inspection of Dams, the project falls into the small category for both criteria and is therefore classified accordingly.

d. Hazard Classification. The Whetstone Brook below Elmville Dam passes through the community of Elmville. The brook first passes the site of an old mill that has been razed by fire and since abandoned. About 600 ft. downstream of the dam the brook flows under State Route 52. Four hundred feet beyond Route 52 the brook passes in close proximity to mill buildings located on the right bank. Just beyond this mill the brook passes under State Route 12 and then enters a wide valley where a modern industrial and office complex is located. After passing this complex the brook meanders on to the Fivemile River. The channel of the brook is relatively small throughout and is only about 10 ft. wide and 3 ft. deep in the vicinity of the modern complex. Though the valley floor is relatively wide, the channel would quickly overflow its banks in the event of a breach of the dam, resulting in flooding of the structures mentioned above. A sudden breach of the dam could therefore cause the loss of a few lives and result in appreciable community and industrial economic losses. Consequentl Elmville Dam has been classified as having a significant hazard potential in accordance with the Recommended Guidelines for Safety Inspection of Dams.

e. Ownership. Elmville Dam is owned by Morris Fisher & Sons, 89 Mechanic Street, Putnam, Connecticut.

f. Operator. Mr. Sidney Fisher, c/o Morris Fisher & Sons, 89 Mechanic St. Putnam, Connecticut. Telephone: (203) 928-2771.

g. Purpose of Dam. The dam was originally constructed to create industrial water storage for the mill which was located just downstream of the dam, now razed. At the present time the dam serves no useful purpose.

h. Design and Construction History. It is not known by whom the dam was constructed; no drawings or reports have been found pertaining to design and construction. The construction is of laid up stone, which has been out of vogue since the turn of the century. This tends to confirm the estimated 1900 year of construction.

i. Normal Operating Procedures. There are no operational procedures for Elmville Dam.

1.3 Pertinent Data

a. Drainage Area. The drainage area above Elmville Dam consists of about 13.9 sq. mi. described in general as rolling terrain. Most of the drainage area is forested, the upper reaches extending to Jerimoth Hill, the highest point in Rhode Island. The drainage area contains numerous mill ponds and reservoirs, the largest of these being Chase Reservoir, Killingly Pond and Middle Reservoir. The upper part of the drainage area which includes these three bodies of water is about half of the total drainage area in the basin. It is about 5 miles long and 4.7 miles wide at its widest point. The highest elevation is 812 ft. on Jerimoth Hill, giving a 527 ft. vertical drop to the spillway crest level.

b. Discharge at Damsite

(1) Outlet Works Conduit. None

(2) Maximum Known Flood at Damsite. The maximum discharge at the damsite is unknown.

(3) Ungated Spillway Capacity at Top of Dam. The total spillway capacity at top of dam, elevation 290.0, is 3,020 cfs.

(4) Ungated Spillway Capacity at Test Flood Elevation. The ungated spillway capacity is about 9,100 cfs at test flood elevation 295.4.

(5) Gated Spillway Capacity at Normal Pool Elevation. Not applicable

(6) Gated Spillway Capacity at Test Flood Elevation. Not applicable

(7) Total Spillway Capacity at Test Flood Elevation. The total spillway capacity at the test flood elevation is 9,100 cfs at elevation 295.4.

(8) Total Project Discharge at Test Flood Elevation. The total project discharge at test flood elevation 295.4 is 10,800 cfs.

c. Elevations (Ft. above NGVD)

(1) Streambed at centerline of dam - 259.0

(2) Maximum tailwater - Not available

(3) Upstream invert of outlet culvert - Not applicable

(4) Recreation Pool - Not applicable

(5) Full flood control pool - Not applicable

(6) Ungated spillway crest - 285 (assumed)

(7) Design surcharge (original design) - Unknown

(8) Top of Dam - Dike varies from 290.0 to 292.5
Right Abutment - 290.0
Left Abutment - 291.0

(9) Test flood design surcharge - 295.4

d. Reservoir

(1) Length of maximum pool - 800(±) ft.

(2) Length of recreation pool - Not applicable

(3) Length of flood control pool - Not applicable

e. Storage (acre-ft.)

(1) Recreation pool - Not applicable

(2) Flood control pool - Not applicable

(3) Spillway crest pool El. 285.0 - 14.6

(4) Top of dam El. 290.0 - 26.0

(5) Test flood pool El. 295.4 - 45.5

f. Reservoir Surface (acres)

(1) Recreation pool - Not applicable

(2) Flood control pool - Not applicable

(3) Spillway crest El. 285.0 - 1.83

(4) Top of dam El. 290.0 - 2.75

(5) Test flood pool El. 295.4 - 3.65

g. Dam

(1) Type - Gravity stone overflow section with downstream vertical face and earth dike.

(2) Length - 200 ft.

(3) Height - 31 ft.

(4) Top width - Overflow section - 10 ft.
Dike - 15 ft.

(5) Side slopes - Upstream unknown
Downstream: overflow section, vertical face; dike, 1½ to 2 horizontal to 1 vertical

(6) Zoning - Not applicable

(7) Impervious core - Not applicable

(8) Cutoff - Unknown

(9) Grout curtain - Unknown

h. Diversion and Regulating Tunnel - None

i. Spillway

(1) Type - Overflow gravity dam

(2) Length of weir - 90 ft.

(3) Crest elevation - 285 ft. (assumed)

(4) Gates - None

(5) Upstream channel - Natural river channel

(6) Downstream channel - Natural river channel

j. Regulating Outlets

(1) Invert - 283 ft. ±

(2) Size - 3 ft. x 4 ft. (approximately)

(3) Description - Sluiceway to old mill site through right end of dike.

(4) Control Mechanism - Inoperative, manual

(5) Other - The sluiceway canal is filled with debris just downstream of the dike.

SECTION 2 - ENGINEERING DATA

2.1 Design Data

No data on the design of the dam or appurtenances has been recovered and probably none exists.

2.2 Construction Data

No records or correspondence regarding construction have been found. A plan has been located showing the proposed East Killingly Interceptor for the Town of Killingly. The plan shows that the interceptor was designed to pass through the earth dike section of Elmville Dam. The field inspection of 21 August 1979 confirmed that the sewer line was installed through the dike, which has been reconstructed to accommodate the interceptor. The plan can be found in Appendix B.

2.3 Operation Data

There appear to be no records of operation of the dam. There are no operating devices in working order at present.

2.4 Evaluation of Data

a. Availability. Since no engineering data is available, it is not possible to make an assessment of the safety of the dam. The basis of the information presented in this report is principally the visual observations of the inspection team.

b. Adequacy. The lack of in-depth engineering data did not allow for a definitive review. Therefore, the adequacy of this dam could not be assessed from the standpoint of reviewing design and construction data, but is based primarily on visual inspection, past performance history and sound engineering judgement.

c. Validity. Not applicable

SECTION 3 - VISUAL INSPECTION

3.1 Findings

a. General. The visual inspection of Elmville Dam took place on 21 August 1979. On that date water was flowing over the crest of the overflow section of the dam for about two thirds of its length and at a depth averaging about 1 in. (Appendix C, Photo No. 1). The discharge over the dam was estimated to be about 10 cfs. There is no low level outlet for the dam. The gate to the abandoned diversion canal was closed and inoperative. Though there were no major problems, several items require attention (see Sections 7.2 and 7.3). In general the dam was judged to be in fair condition.

b. Dam. The dam is a run-of-the-river dam with an overall length of about 200 ft. It has a hydraulic height of about 31 ft. The principal elements of the dam are a 90 ft. long overflow section constructed of laid up masonry with unmortared joints, to the right of which is an earth fill dike which is about 110 ft. long. At the right end of the earth embankment is an abandoned, debris-choked diversion canal with an inoperative gate. This channel originally led to a mill located just downstream of the dam on the right bank of the brook, now razed.

c. Appurtenant Structures.

(1) Spillway. The masonry overflow section was in good condition, considering its evident age and the type of construction. There are training walls located at each end of the overflow section which are constructed of laid up masonry. On the south (left) side of the spillway the training wall joins directly to outcropping rock (Appendix C, Photo No. 2). The north (right) training wall is not intact, and the once retained dike embankment in that area had eroded on the upstream side. The crest of the spillway is constructed of 8 ft. long capstones which have settled a minor amount. Siltation has taken place upstream of the dam and was up to the crest of the spillway on the left side, supporting luxuriant vegetation (Overview Photo No. 1).

(2) Dike. The general condition of the earth dike appeared to be fair. The earth embankment was heavily overgrown on the upstream and downstream face with many mature trees (Appendix C, Photo No. 3). A 20 in. dia. cast iron pipe section of a 21 in. dia. sewer line has been constructed through and beneath the embankment in recent years, as shown on the drawing in Appendix B. No seepage cut-offs are shown on the plans and the types of backfill materials within the excavation through the embankment cannot be ascertained from the drawings. At mid-embankment, massive rocks have been randomly dumped on the downstream slope of the dam, and may be associated with the sewer construction (Appendix C. Photo No. 4). No riprap appears to be present on the upstream face of the embankment. The materials of the embankment, at least in the vicinity of the back-filled zone of the sewer, were granular and quite permeable to a depth of at least 1 foot. It was estimated that less than 10% of the material would

pass the No. 200 sieve. The surface of the backfill and the crest of the embankment in this area were unprotected by sod or controlled grasses. There was no riprap protection on any of the surfaces of the upstream slope (Appendix C, Photo No. 3). At the toe of the embankment, about 75 ft. right of the right training wall, there was a marshy zone, exhibiting characteristic wetlands growth, but with no actual flow discernible. The height of most of the embankment was about 7.5 ft. above the crest of the spillway, but as previously mentioned, the embankment had sloughed toward the overflow section in the area of the right training wall, and was only about 5 ft. above the spillway in this area. There were signs of significant trespassing on the embankment with a well worn path from the top of the embankment down to stream level.

(3) Diversion Canal and Headworks. The old mill canal passes through the right end of the earth dike, via a concrete headworks. The concrete was in fair condition, with some spalling and surface deterioration. The single wooden gate in the headworks appeared to be in fair condition and the operating mechanism seemed to be intact, but was not operative (Appendix C, Photo No. 5). Just down stream of the embankment the canal is totally obstructed with demolition debris and no flow appears to be passing through the gate.

d. Reservoir Area. The reservoir is a ponding of the Whetstone Brook. The shores of the impoundment evidence all but continuous rock outcrops at and near the water surface. The slopes are stable.

e. Downstream Channel. The overflow section discharges into a narrow downstream channel, heavily bouldered, with little obstructing growth. About 100 yards downstream of the dam on the right bank, there are the ruins of what was once an extensive mill complex, which has been destroyed by fire. Just downstream of the old mill site there was a very low masonry dam or weir across the brook which was fitted with 6 in. flashboards. After flowing over this dam the brook passes under State Route 52 and then enters a relatively wide valley. Between Route 52 and State Route 12 there is an old mill building located on the right bank which was still in use. This building is in close proximity to the brook and would be flooded by high water. After passing the mill the brook crosses under State Route 12 and then enters an even wider valley in which a new industrial and office complex has recently been built close to the brook (Appendix C, Photo No. 6). Shortly after passing this new development, the brook meanders and meets the Fivemile River at a point about 0.7 mile below the Elmville Dam.

3.2 Evaluation

The visual inspection of the dam adequately revealed key characteristics as they may relate to its stability and integrity, permitting an assessment to be made of those features affecting the safety of the structure. The Elmville Dam and appurtenant works are judged to be in generally fair condition. There is no low level outlet for the facility. There is considerable tree growth on the dike, which has no riprap protection on the upstream slope. The right training wall does not adequately retain the end of the earth dike and sloughing has occurred in this area. The design criteria and construction techniques associated with the recent sewer construction are suspect as they pertain to the safety of the dam and should be investigated further. The diversion canal headworks are in fair condition, but the sluice gate is not operative.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 Procedures

The Morris Fisher & Son Company is the owner and operator of the dam. There are no operating devices in working order nor any documented operating procedures for the dam.

4.2 Maintenance of Dam

There is no maintenance program in effect at Elmville Dam.

4.3 Maintenance of Operating Facilities

No maintenance program is in effect. The gate at the head of the diversion canal is inoperative. There are no other operating devices.

4.4 Description of any Warning System in Effect

No warning system is in effect at Elmville Dam.

4.5 Evaluation

There has been no maintenance in recent years. Maintenance should involve periodic growth removal from the dike, surveillance regarding seeps and animal burrows, and keeping the spillway crest clear of debris. The owner should establish a formal warning system.

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 Evaluation of Features

a. General. The Elmville Dam is a run-of-the-river type project, originally constructed to furnish the water needs of a mill located just downstream of the dam. It now has no useful purpose. It is basically a low storage-high spillage dam. It consists of a laid up stone overflow section and an earth fill dike.

b. Design Data. No hydrologic or hydraulic design data were retrieved for Elmville Dam.

c. Experience Data. No records are available in regard to past operation of the dam or of surcharge encroachments and outflows through the spillway.

d. Visual Observations. No evidence which would indicate possible high flows through the reservoir area or in the downstream channel were noted.

e. Test Flood Analysis. Elmville Dam is about 31 ft. high and impounds about 26.0 acre-ft. to the top of dam; it is therefore classified as small in size. Because of the downstream conditions, the hazard potential is classified as significant. In accordance with Recommended Guidelines for Safety Inspection of Dams, the recommended test flood is a 100 year frequency to one half the probable maximum flood (½ PMF). A test flood of a magnitude corresponding to ½ PMF was selected as appropriate for the evaluation, because of the developed area and state highways downstream.

The NED March 1978 Preliminary Guidance Memorandum for Estimating Probable Dis-Charges was used for estimating the maximum probable flood peak flow rate, which was then divided by two to arrive at the test value. Based on the drainage area of 13.88 sq. mi. and rolling terrain, the test flood was determined to be about 775 CSM or about 10,800 cfs. Because of the high discharge and low storage capability of the impoundment above the dam, a storage-routing was not performed; the inflow-outflow disparity was considered to be insignificant.

A discharge curve for the dam was computed (see sheets D-4 & D-5). With the reservoir to the top of dam (top of the right abutment wall), elevation 290.0, the spillway can release about 3,020 cfs or about 28 percent of the test flood outflow. The overflow portion of the dam will not pass the test flood outflow without an overtopping of the non-overflow section and the dike. The water depth over the top of the dam would be about 5.4 ft. and the discharge over the spillway would be about 9,100 cfs or 84 percent of the test flood outflow. The highest point on the dike, elevation 292.5, would be overtopped by 2.9 ft. under test flood conditions.

f. Dam Failure Analysis. A breach owing to structural failure of the dam is a possibility. For this analysis failure was assumed to occur with the water

level at the top of the right abutment, elevation 290.0. The "rule of thumb" criteria suggested in the NED March 1978 Guidance Report was used. With a breach width of 40 percent of the dike length, or about 44 Ft., an outflow of about 15,800 cfs, which includes 3,000 cfs from the spillway, would be realized (see sheets D-7 thru D-14, Appendix D).

A profile of the stream below the dam and approximate cross sections of three reaches were determined from the U.S.G.S. 2,000 ft. per in. quadrangle sheets, supplemented by estimates made in the field. Reach 1 (Sta. 0 to 6+00) extends from the dam to the crossing of Route 52; Reach 2 (Sta. 6+00 to 11+00) extends from Route 52 to Route 12; Reach 3 (Sta. 11+00 to 19+00) extends from Route 12 to the vicinity of the CEM building complex.

Sheets D-7 thru D-14, Appendix D, show estimated discharges and stages in each reach before and after failure of the dam, which are summarized in the table below:

RESULTS OF DAM FAILURE ANALYSIS

River Section	Pond @ Elev. 290.0 No Breaching of Structure		Pond @ Elev. 290.0 Breach of Dike	
	Disch. cfs	River Stage Ft.	Disch. cfs	River Stage Ft.
Sta. 6+00	3,000	7.6	11,550	15.3
Sta. 11+00	3,000	7.2	9,055	10.1
Sta. 15+00	3,000	4.8	7,696	6.8
Sta. 19+00	3,000	4.8	6,065	6.3

Between the dam and Route 52 there are no buildings which would be affected other than the basements of the demolished mill buildings and some disused auxiliary buildings. It is considered that the State Route 52 bridge opening is adequate to pass the breach flow, but severe scouring of the lightly riprapped abutment slopes would probably occur.

The most significant area to be impacted as a result of a breach of the dike would be the area extending downstream of State Route 52 to a point past the CEM industrial complex. The Whetstone Brook has a relatively narrow stream channel in this area and its banks would easily be overtopped. About 1,100 ft. downstream of the dam and 400 ft. beyond Route 52, a mill complex lies close to the brook on the right bank. It is estimated that the brook's stage would rise about 3.0 ft. above that which was prevailing before the breach, with flooding of the lower levels of the adjacent buildings.

The Route 12 bridge has a limited waterway which is further restricted by utility pipes; it is estimated to be capable of handling only about 1,500 cfs without being overtopped. It is therefore probable that the breach flow would wash out the bridge and the utilities suspended below it.

Below Route 12, the stream channel is only about 10 ft. wide and 3 ft. deep. The CEM complex is located close to the brook and would probably sustain some flood damage before failure of the dam. It is estimated that the brook would rise about 1.5 ft. above the stage which was prevailing before the breach, causing additional flood damage to the CEM buildings. Beyond the CEM complex the brook meanders about 1,000 ft. further downstream before joining the Five-mile River. In this reach it is expected that the flood stage caused by a breach of the dam would be considerably reduced and that no further damaging flood flow would occur (see Appendix D, Sheet D-15 which shows the area of potential flooding).

SECTION 6 - STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observation. The field investigations of the embankment revealed no significant displacement or distress which would warrant the preparation of slope stability computations. The overflow section of the dam and the south abutment appear to be in good condition. The training wall between the masonry overflow section and the earth dike is not intact. Overall, the dam appears to be in fair condition, but as described in Section 7, deficiencies should be corrected, and further investigations conducted.

b. Design and Construction Data. No design or construction data regarding the original dam were recovered. No plans or calculations of value to a stability assessment are available. Plans for recent sewer construction through the dam indicate general geometrics of the structure, and were reviewed (see 6.1.d below).

c. Operating Records. No operating records were recovered and none of any significance to structural stability are known to exist.

d. Post-Construction Changes. A 20 in. dia. cast iron sewer was constructed through and beneath the dam in recent years, as shown on drawings dated January, 1971 prepared by Bowe, Walsh and Associates of Huntington, N.Y. (Appendix B). No seepage cut-offs are shown along the pipe, nor can the types of backfill materials within the excavation through the dam be ascertained from the drawings. Shallow depth visual inspection of the backfilled area revealed only granular materials.

The blockage of the old diversion channel with construction debris also occurred within recent years.

e. Seismic Stability. The dam is located in Seismic Zone No. 1, and in accordance with Phase I Guidelines, does not warrant seismic analysis.

SECTION 7

ASSESSMENT, RECOMMENDATIONS & REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition. On the basis of the Phase I visual examination, Elmville Dam appears to be in generally fair condition. There are no dewatering facilities. The deficiencies revealed, however, indicate that a further investigation should be carried out and that some remedial work is needed. The major concerns with the overall integrity of the dam are as follows:

(1) The spillway will only pass about 28 percent of the test flood outflow.

(2) The right training wall is not intact and earth is spilling into the overflow section.

(3) The impact of the recent sewer construction on dam integrity.

(4) The lack of a low level outlet for the dam.

(5) The lack of riprap on the upstream face of the dike.

b. Adequacy of Information. The lack of in-depth engineering data did not allow for a definitive review. Therefore, the adequacy of this dam could not be assessed from the standpoint of reviewing design and construction data, but is based primarily on visual inspection, past performance history, and should engineering judgement.

c. Urgency. The recommendations and remedial measures enumerated below should be implemented by the owner within one year after receipt of this Phase I Inspection Report.

d. Need for Additional Investigations. Additional investigations are required as recommended in Para. 7.2.

7.2 Recommendations

It is recommended that the owner should retain the services of a competent registered professional engineer to make investigations and studies of the following, and if proved necessary, to design appropriate remedial works.

(1) Make a thorough study of the hydrology of the drainage basin and review the spillway adequacy in relation to potential overtopping of the dike.

(2) Evaluate the need for providing a means to safely drain the pond.

(3) Evaluate the impact on dam integrity of the recent installation of the 20 in. dia. cast iron sewer through the dam.

(4) Evaluate the need for riprap on the upstream face of the embankment section.

(5) Study the engineering implications of restoring the overflow canal and gate structure to an operating condition.

(6) Evaluate the need for repairing the right training wall to prevent further sloughing of the dike.

7.3 Remedial Measures

a. Operating and Maintenance Procedures

(1) Clear tree and brush growth from the right embankment section.

(2) Restore worn pathways caused by trespassers and restore loss of ground at embankment crest.

(3) Monitor, once per month, zone of possible seepage at toe of right embankment, 75 ft. north of overflow section.

(4) Procedures for an annual periodic technical inspection of the dam and appurtenant works should be instituted.

(5) A formal surveillance and flood warning plan should be developed, including round-the-clock monitoring during periods of heavy rainfall.

7.4 Alternatives

The only practical alternative would be to breach the dam under the auspices of a registered professional engineer with due consideration to environmental effects.

APPENDIX A

INSPECTION CHECKLIST

VISUAL INSPECTION CHECKLIST
PARTY ORGANIZATION

PROJECT Elmville Dam

DATE 21 August 1979

TIME 1:30 PM

WEATHER Clear, warm

W.S. ELEV. 285.1 U.S. NA DN.S.

PARTY:

1. Peter B. Dyson
2. Carl J. Hoffman
3. Roger F. Berry
4. James H. Reynolds
5. Sidney Fisher
6.
7.
8.
9.
10.

	PROJECT FEATURE	INSPECTED BY	REMARKS
1.	Hydrology	Roger F. Berry	
2.	Hydraulics/Structures	Carl J. Hoffman	
3.	Soils and Geology	James H. Reynolds	
4.	General Features	Peter B. Dyson	
5.			
6.			
7.			
8.			
9.			
10.			

PERIODIC INSPECTION CHECKLIST

PROJECT Elmville Dam DATE 21 August 1979

PROJECT FEATURE Stone Masonry Dam NAME

DISCIPLINE Structures NAME Carl J. Hoffman

AREA EVALUATED	CONDITIONS
DAM EMBANKMENT	
Crest Elevation	285.0 (assumed)
Current Pool Elevation	285.1
Maximum Impoundment to Date	Not known
Surface Cracks	N.A.
Pavement Condition	N.A.
Movement or Settlement of Crest	Slight
Lateral Movement	None evident
Vertical Alignment	Good
Horizontal Alignment	Good
Condition at Abutment and at Concrete Structures	Right training wall is not intact.
Indications of Movement of Structural Items on Slopes	None
Trespassing on Slopes	Frequent. Heavily worn foot paths.
Sloughing or Erosion of Slopes or Abutments	Loss of embankment at right training wall. Upstream face locally eroded.
Rock Slope Protection - Riprap Failures	No riprap discernible
Unusual Movement or Cracking at or near Toes	None
Unusual Embankment or Downstream Seepage	Wet marshy zone at toe of embankment 75 feet north of spillway
Piping or Boils	None
Foundation Drainage Features	None
Toe Drains	None
Instrumentation System	None

PERIODIC INSPECTION CHECKLIST

PROJECT Elmville Dam DATE 21 August 1979

PROJECT FEATURE Dike (Earth) NAME

DISCIPLINE Soils/Geology NAME James H. Reynolds

AREA EVALUATED	CONDITIONS
DIKE EMBANKMENT	
Crest Elevation	292.5
Current Pool Elevation	285.1
Maximum Impoundment to Date	Not known
Surface Cracks	None
Pavement Condition	N.A.
Movement or Settlement of Crest	None
Lateral Movement	None
Vertical Alignment	Good
Horizontal Alignment	Good
Condition at Abutment and at Concrete Structures	Right training wall not intact
Indications of Movement of Structural Items on Slopes	None
Trespassing on Slopes	Frequent. Heavily worn foot paths.
Sloughing or Erosion of Slopes or Abutments	Loss of ground on embankment at training wall. Upstream face locally eroded.
Rock Slope Protection - Riprap Failures	No riprap discernible
Unusual Movement or Cracking at or near Toes	None
Unusual Embankment or Downstream Seepage	Wet marshy zone at toe of embankment 75 feet north of masonry section
Piping or Boils	None
Foundation Drainage Features	None
Toe Drains	None
Instrumentation System	None

NOTE: Heavy growth on embankment, many mature trees, several with a diameter of 2 feet.

(cont'd next page)

Surface examination indicates central zone of embankment to be permeable, granular material, evidently used as sewer line backfill.

PERIODIC INSPECTION CHECKLIST

PROJECT Elmville Dam DATE 21 August 1979

PROJECT FEATURE Diversion canal NAME

DISCIPLINE Structures/Hydraulics NAME Carl J. Hoffman

AREA EVALUATED	CONDITIONS
OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	
General Condition of Concrete	Good
Rust or Staining	None evident
Spalling	None evident
Erosion or Cavitation	None evident
Visible Reinforcing	None
Any Seepage or Efflorescence	None
Condition at Joints	Good
Drain Holes	N.A.
Channel	
Loose Rock or Trees Overhanging Channel	Some
Condition of Discharge Channel	Poor

NOTE: Diversion channel filled with demolition debris just downstream of earth embankment.

PERIODIC INSPECTION CHECKLIST

'ROJECT Elmville Dam DATE 21 August 1979

'ROJECT FEATURE Spillway NAME

)ISCIPLINE Structure/Hydraulics NAME Carl J. Hoffman

AREA EVALUATED	CONDITIONS
)UTLET WORKS - SPILLWAY WEIR, APPROACH ND DISCHARGE CHANNELS	
1. Approach Channel	
General Condition	Good
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	None
Floor of Approach Channel	Some silt buildup on left side
). Weir and Training Walls	Stone Masonry
General Condition of Concrete	N.A.
Rust or Staining	N.A.
Spalling	N.A.
Any Visible Reinforcing	N.A.
Any Seepage or Efflorescence	N.A.
Drain Holes	None
:. Discharge Channel	
General Condition	Good
Loose Rock Overhanging Channel	Some
Trees Overhanging Channel	Some
Floor of Channel	Rocky
Other Obstructions	None

PERIODIC INSPECTION CHECKLIST

PROJECT: Elmville Dam DATE: 21 August 1979

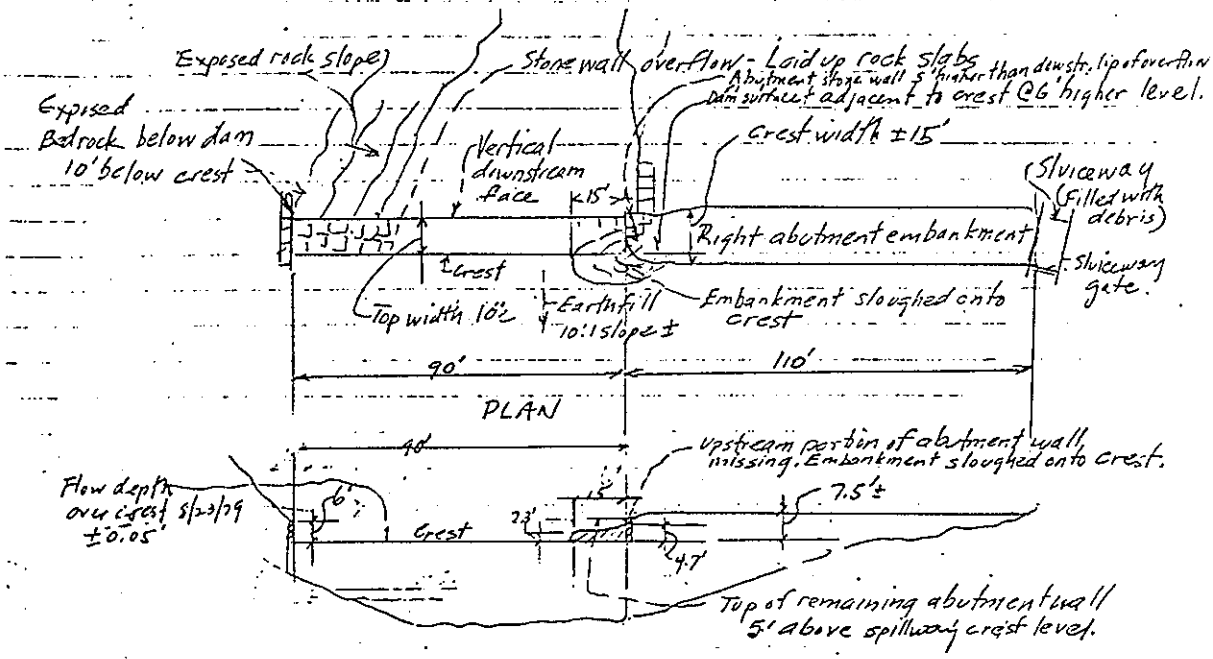
AREA EVALUATED	CONDITIONS
Outlet Works - Control Tower	N.A.
Outlet Works - Intake Channel and Intake Structure	N.A.
Outlet Works - Transition and Conduit	N.A.
Outlet Works - Service Bridge	N.A.

APPENDIX B

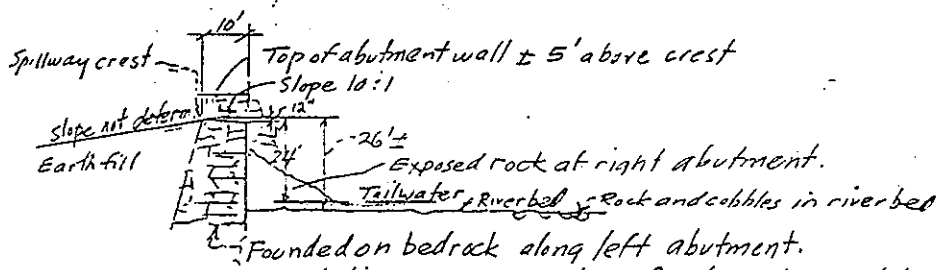
ENGINEERING DATA

CT. No Name # 5 (Killingsly) at Elmville

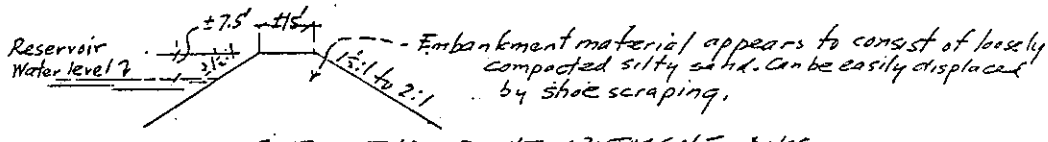
PLAN, PROFILE AND SECTIONS



PROFILE OF DAM AND SPILLWAY



SECTION THRU OVERFLOW STONEWALL



SECTION THRU RIGHT ABUTMENT DIKE

★ THINK CASH! Send in a suggestion. You could win an award! ★
Send your suggestion to: *Employees' Suggestion Awards Program, 165 Capitol Ave., Hartford, 06115.*

Interdepartment Message

STO-201 REV. 3/77 STATE OF CONNECTICUT
(Stock No. 6938-051-01)

SAVE TIME: *Handwritten messages are acceptable. Use carbon if you really need a copy. If typewritten, ignore faint lines.*

To	NAME: Victor F. Galgowski	TITLE: Supt. of Dam Maintenance	DATE: 23 May 1978
	AGENCY: Water Resources Unit	ADDRESS:	
From	NAME: Charles J. Pelletier	TITLE: Consultant	TELEPHONE:
	AGENCY: Environmental Protection	ADDRESS:	

SUBJECT: Dam at Elmville, Killingly 1

This dam was inspected on May 19, 1978.

The spillway is stone masonry about 24 feet high and 90 feet long. Training walls at the ends of the spillway are about 5' above spillway crest.

There is a gate structure and canal adjacent to the road at the north end of the dam. The dam between the gate structure and the north end of the spillway is an earth fill about 100 feet long. The earth fill is about six feet above the spillway, has a 15 foot top width and approximately 2:1 side slopes.

About 60% of the earth section has been disturbed by excavation to install a sanitary sewer which apparently passes under the dam about 30 feet south from the gate structure. The area disturbed is bare soil which appears to be a sandy gravel. Test holes were hand dug; one on top of the fill and one in the upstream slope about three feet below the top of the slope. The top surface is compact sandy gravel. The material on the slope is very sandy gravel and easily penetrated; a two foot hole was excavated with ease.

There is an area of saturated soil on the downstream side of the earth fill in the disturbed area six to ten feet below the spillway. Visible seepage flow is 1 to 2 gallons per minute.

Surficially the structure appears stable. However, these are two unknowns which must be investigated in order to make an estimate of the condition of this dam.

1. The nature of the sewer construction and its position relative to the dam must be determined.

2. The details of reconstruction of the earth embankment must be determined including such things as the types of soils used, the method of compaction, degree of compaction, etc.

SAVE TIME: *If convenient, handwrite reply to sender on this same sheet.*

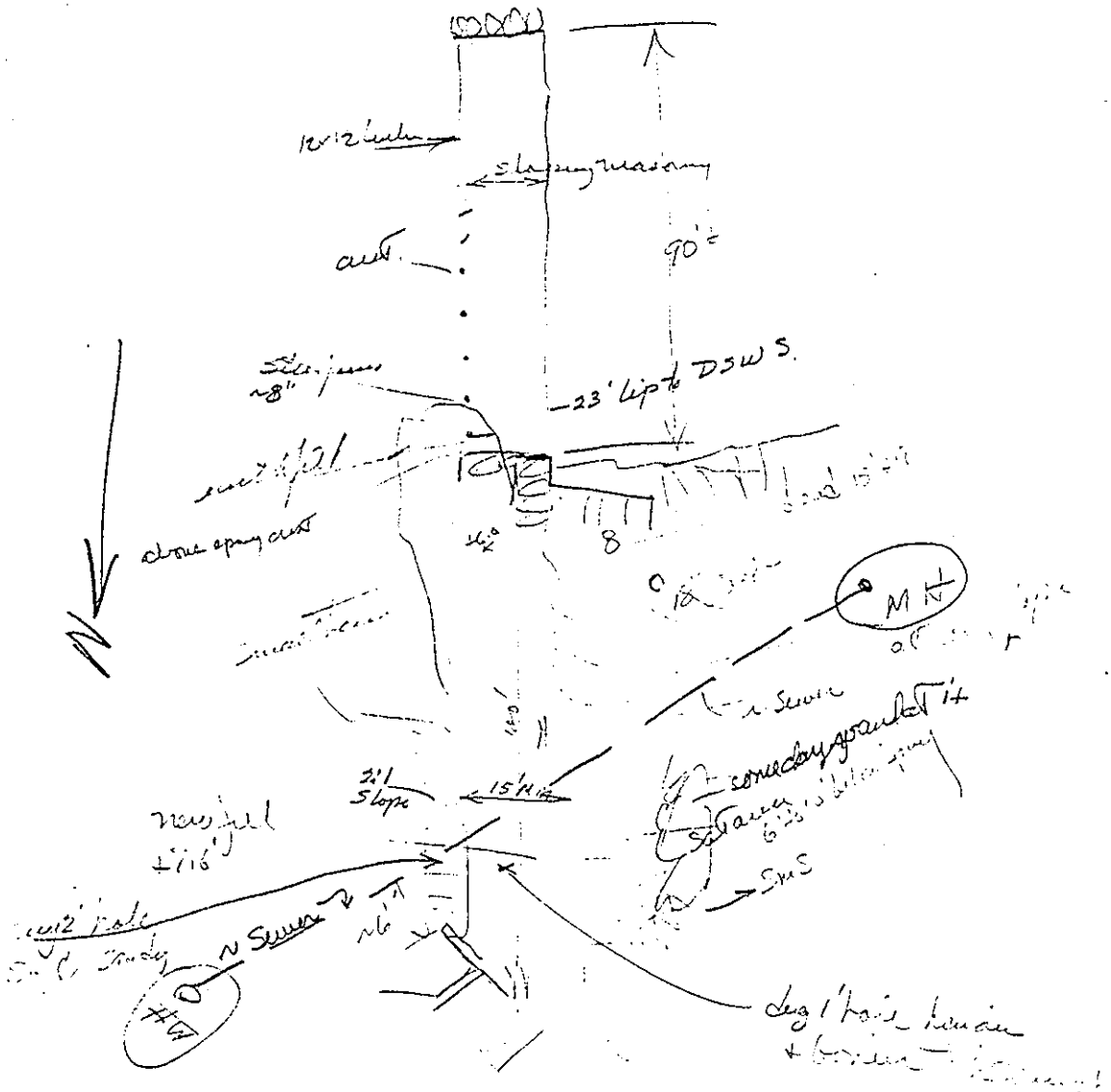
Perhaps some of the required data can be obtained from the Water Quality Unit. They may have reviewed and approved the plans for this sewer extension.

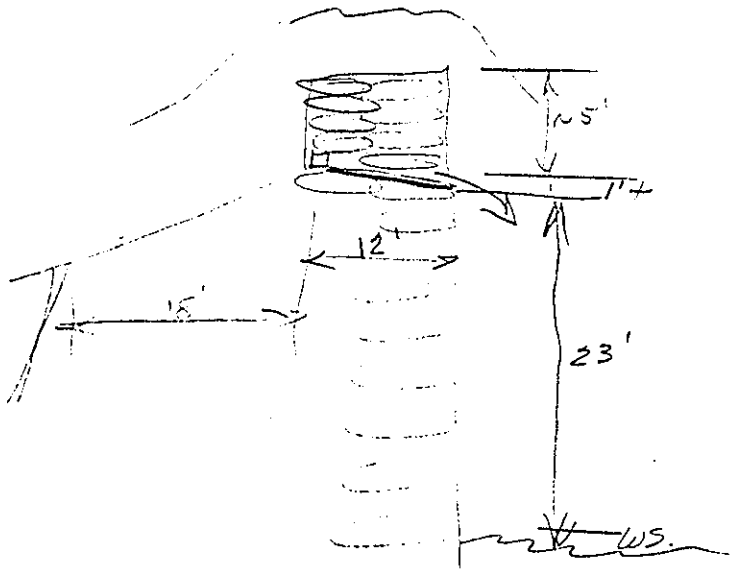
In the interim, the condition of this earth fill and the seepage should be inspected periodically.

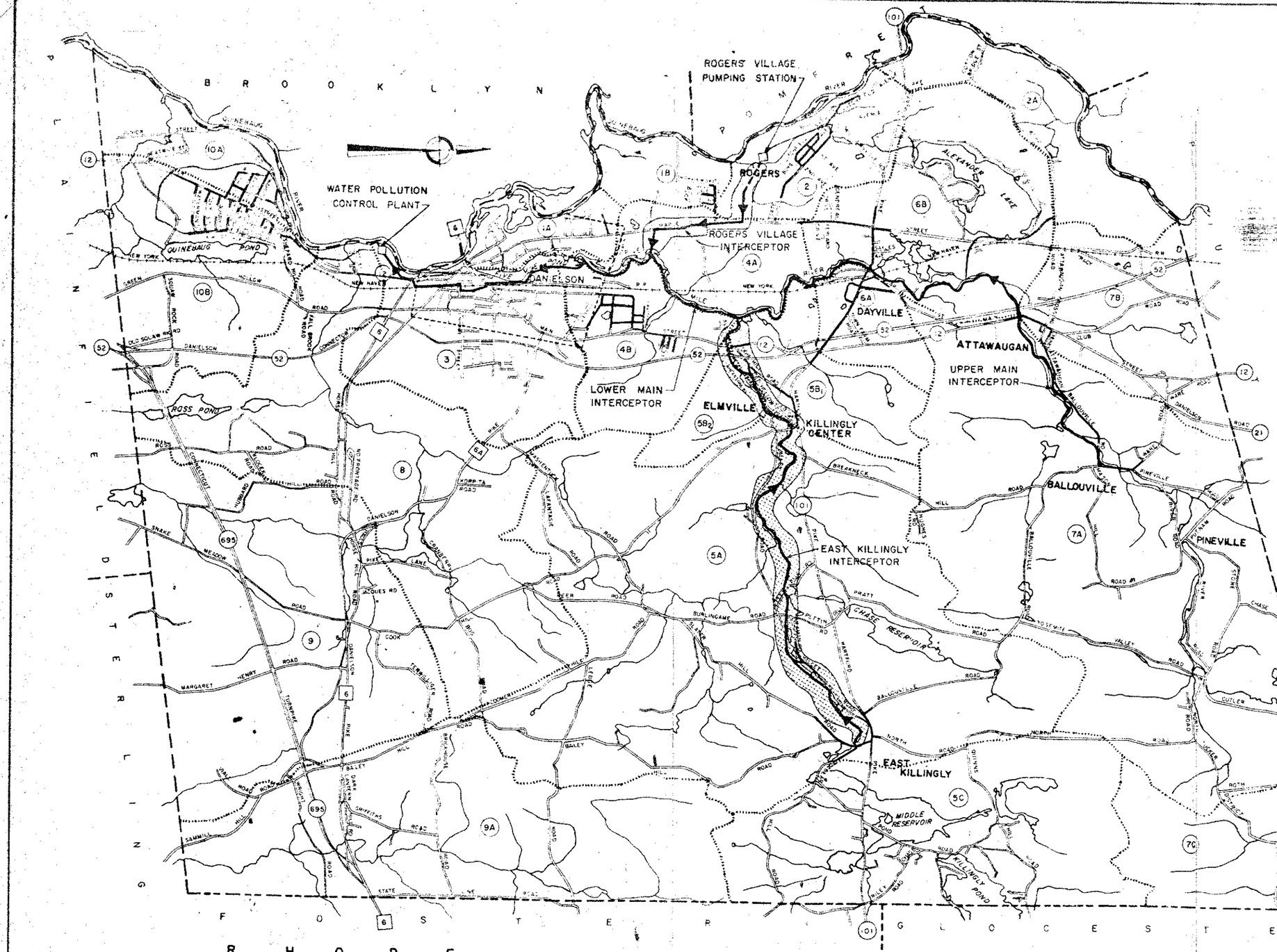
Water Resources Unit

CJP:ljk

Killingly #1 5-19-78




~5'
1'+
12'
15'
23'
W.S.



LEGEND

EAST KILLINGLY INTERCEPTOR
ROGER'S VILLAGE INTERCEPTOR
} CONTRACT NO 4

PROPOSED SEWAGE SYSTEM
TOWN OF KILLINGLY
WINDHAM COUNTY, CONN.

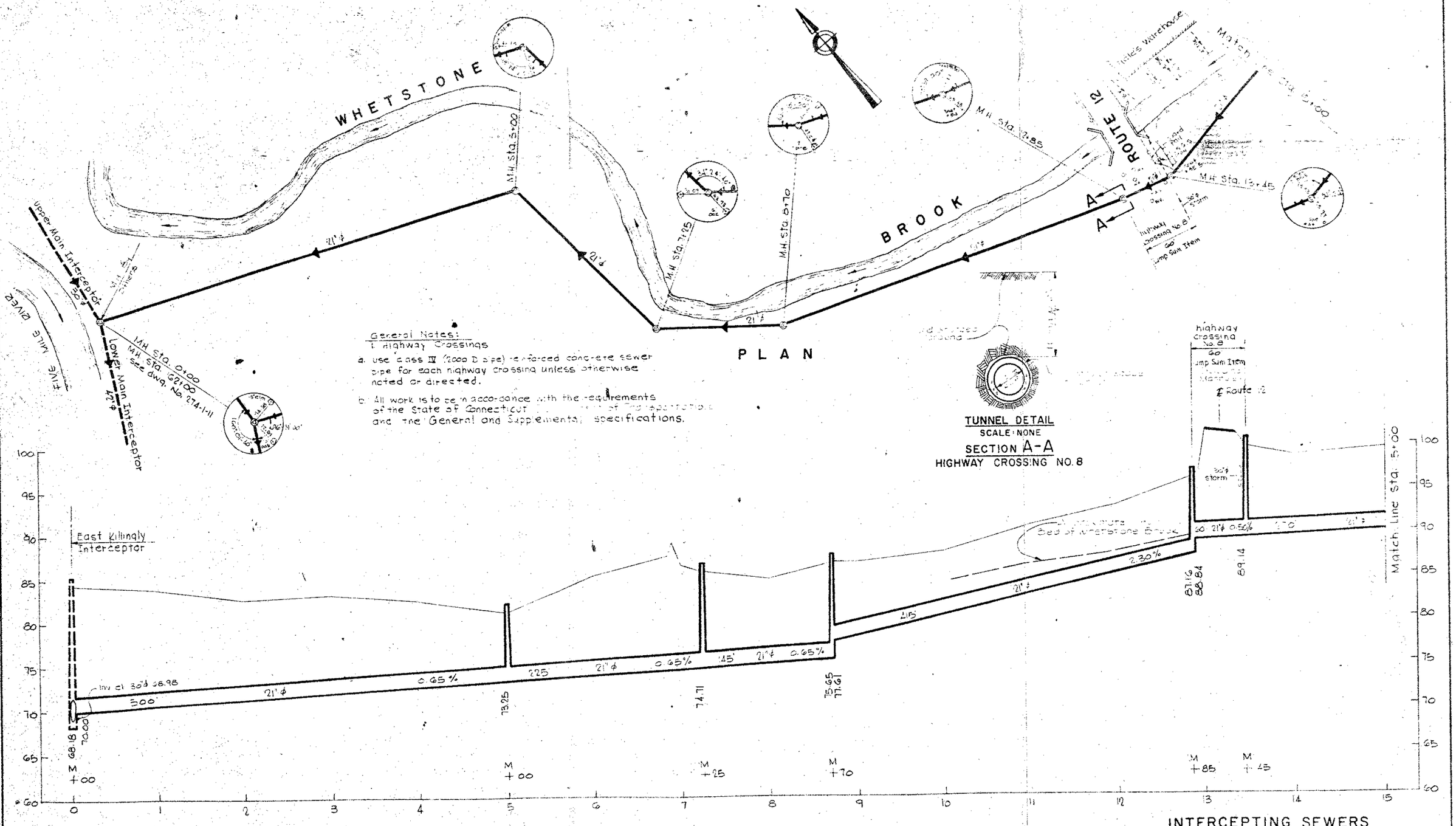
GENERAL PLAN

BOWE, WALSH & ASSOCIATES
ENGINEERS
HUNTINGTON, NEW YORK

SCALE 1"=2000'

JANUARY 1971
DWG NO 274-1-G1

B-6



PLAN

General Notes:
1. Highway Crossings

a. use Class III (2000 D pipe) reinforced concrete sewer pipe for each highway crossing unless otherwise noted or directed.

b. All work is to be in accordance with the requirements of the State of Connecticut [illegible] and the General and Supplemental specifications.

TUNNEL DETAIL
SCALE: NONE
SECTION A-A
HIGHWAY CROSSING NO. 8

PROFILE

NO.	DATE	REVISIONS

INTERCEPTING SEWERS
PROPOSED SEWAGE WORKS
TOWN OF KILLINGLY
WINDHAM COUNTY, CONN.

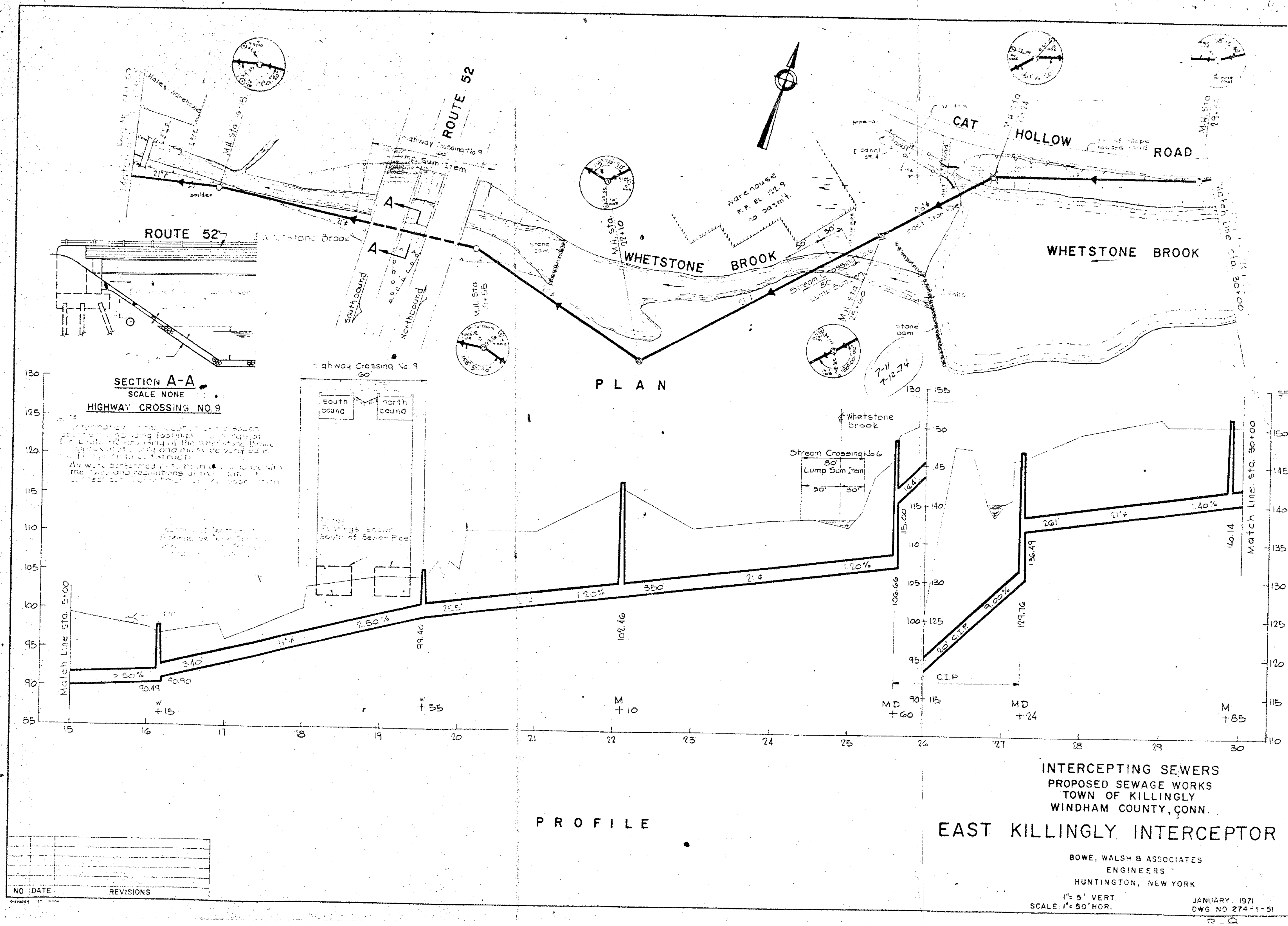
EAST KILLINGLY INTERCEPTOR

BOWE, WALSH & ASSOCIATES
ENGINEERS
HUNTINGTON, NEW YORK

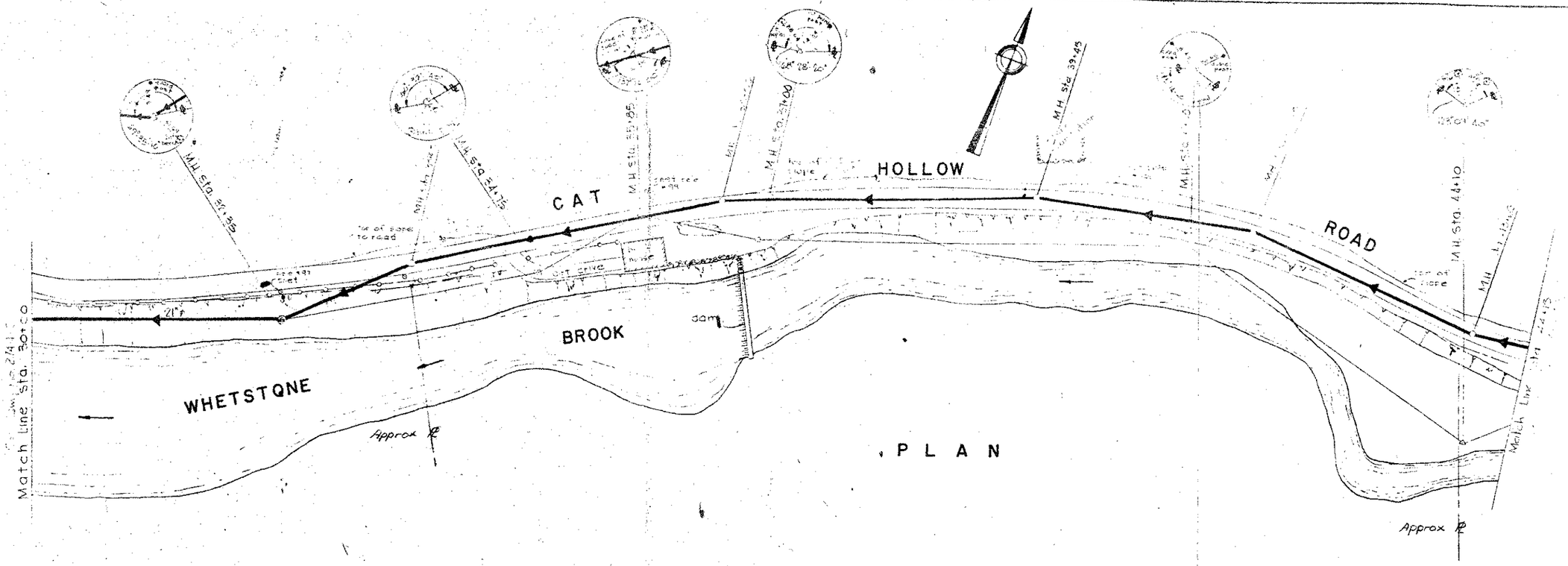
1"= 5' VERT.
SCALE 1"= 50' HOR.

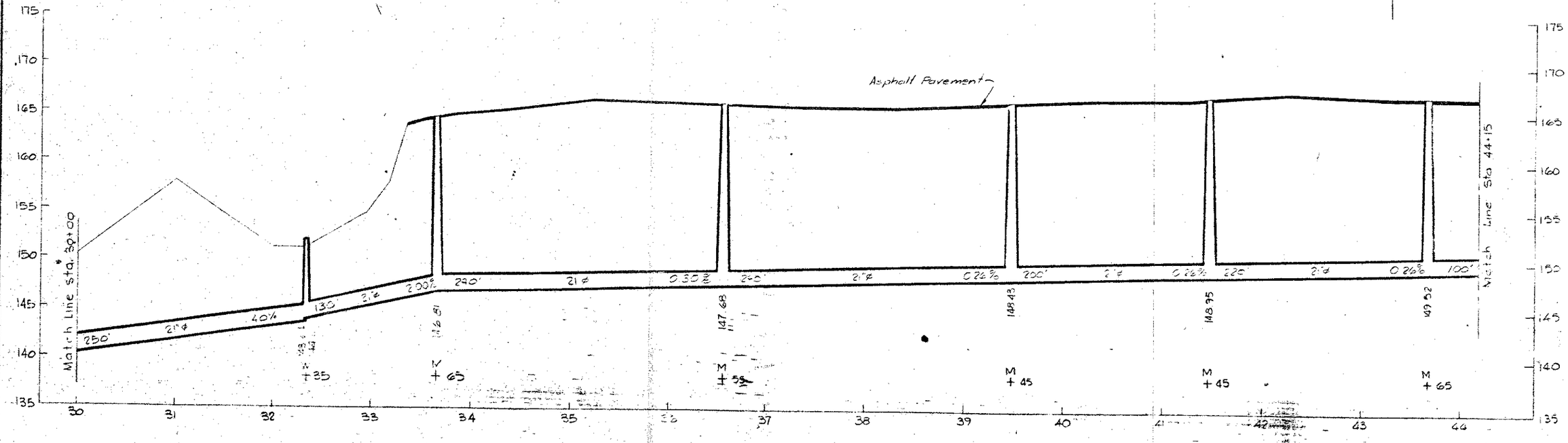
JANUARY 1971
DWG NO 274-1-50

B-7



ROUTE 52
CAT HOLLOW ROAD
WHETSTONE BROOK
WHETSTONE BROOK
PLAN
SECTION A-A
SCALE NONE
HIGHWAY CROSSING NO. 9
Highway Crossing No. 9
160'
south bound
north bound
Stream Crossing No. 6
80'
Lump Sum Item
Whetstone brook
Warehouse
F.F. EL. 122.9
no basm't
Stone dam
Falls
Southbound
Northbound
M.H. Sta. 22+10
M.H. Sta. 19+55
M.H. Sta. 25+60
Match Line Sta. 15+00
Match Line Sta. 30+00
2.50%
1.20%
1.20%
1.40%
9.00%
20" C.I.P.
C.I.P.
90.49
90.90
99.40
102.46
106.66
115.00
129.76
136.49
140.14
340'
255'
350'
261'
PROFILE
INTERCEPTING SEWERS
PROPOSED SEWAGE WORKS
TOWN OF KILLINGLY
WINDHAM COUNTY, CONN.
EAST KILLINGLY INTERCEPTOR
BOWE, WALSH & ASSOCIATES
ENGINEERS
HUNTINGTON, NEW YORK
SCALE 1"= 5' VERT.
1"= 50' HOR.
JANUARY, 1971
DWG. NO. 274-1-51
NO. DATE REVISIONS





NO	DATE	REVISIONS

INTERCEPTING SEWERS
PROPOSED SEWAGE WORKS
TOWN OF KILLINGLY
WINDHAM COUNTY, CONN.

EAST KILLINGLY INTERCEPTOR

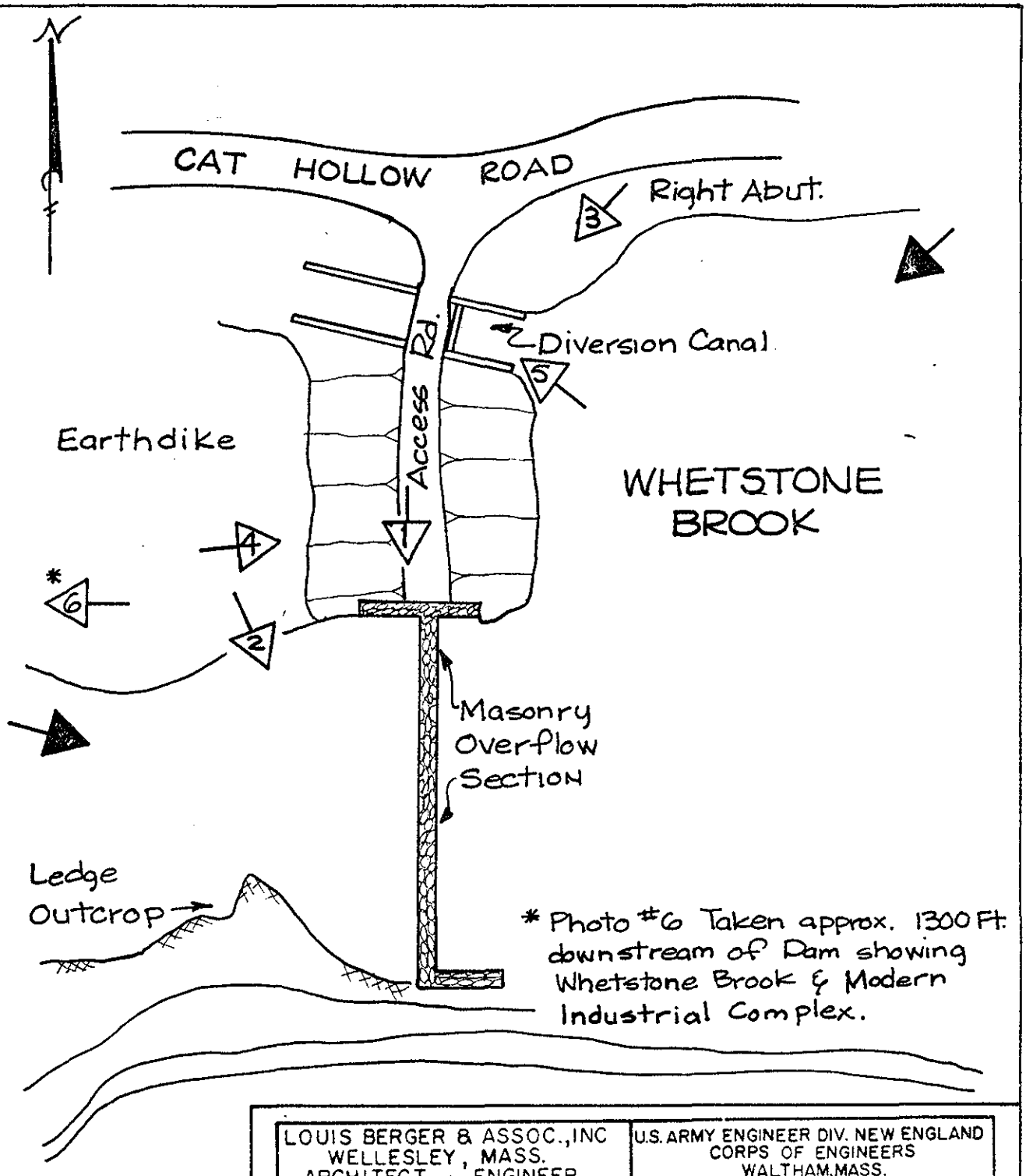
BOWE, WALSH & ASSOCIATES
ENGINEERS
HUNTINGTON, NEW YORK

SCALE 1" = 5' VERT.
1" = 50' HOR.

JANUARY, 1971
DWG NO 274-1-52

APPENDIX C

PHOTOGRAPHS



Appendix "C" Photos

Overview Photos

LOUIS BERGER & ASSOC., INC WELLESLEY, MASS. ARCHITECT · ENGINEER	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

ELMVILLE DAM

SKETCH PLAN SHOWING LOCATION & ORIENTATION OF PHOTOS

STATE - CT.

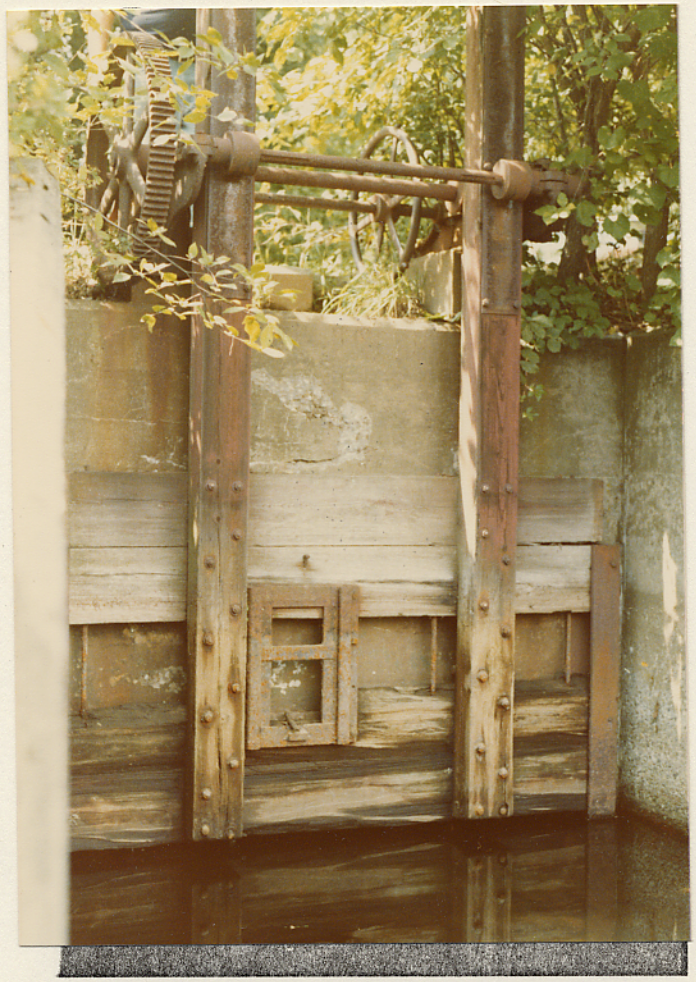
			SCALE
			DATE

1. Crest of overflow section

2. Ledge rock outcrop at left end of overflow section.

3. Upstream face of earth dike and diversion channel entrance at right abutment.

4. Downstream slope of earth dike showing dumped rock.



5. Diversion canal headworks gate.

6. Whetstone Brook downstream of Route 12 in vicinity of CEM Co., Inc., buildings.

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

BY JKH DATE 9/6/79 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. 1 OF

CHKD. BY DATE INSPECTION OF DAMS - CONN & RI PROJECT

SUBJECT CT 165, NO NAME #5 - DRAINAGE AREA
(ELMVILLE DAM)

FIND: ENTIRE AREA ABOVE DAM

PLANIMETER No 3651-30
INDEX @ 89.9
1.0 = 1 sq. in.

USGS Sheet	Ave Reading (sq. in.)
East Killingly, Conn., RI.	(9.5x5.4) + 6.16 + 14.61 + 7.81 + 5.59 + 4.60 + 5.85 − 0.15 = 95.75
Thompson, Conn., R.I.	0.36 + 0.65 = 1.01

TOTAL = 96.76

Scale: $(1")^2 = (1{,}000')^2$ 4,000,000 sq ft/sq. in.

$$\text{Area} = \frac{96.76 \text{ sq. in} \times 4\times10^6 \text{ sq ft/sq in.}}{43{,}560 \text{ sq. ft/acre}} = \boxed{8{,}885.22 \text{ Acre}}$$

8,885.22 Acres ÷ 640 Acres/sq. mi. = 13.88 sq mi

BY RFB DATE 8-30-79 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. 1 OF

CHKD. BY DATE INSPECTION OF DAMS PROJECT

SUBJECT Ct No Name No 5, Elmville, Storage Capacity

@ Elev. 285 Read #2 20.67 Read #3 20.69 Ave. = .02
" #1 20.65 " #2 20.67
.02 .02
1.83 Acres

@ Elev. 290 Read #2 20.72 Read #3 20.75 Ave. = .03
" #1 20.69 " #2 20.72
.03 .03
2.75 Acres

@ Elev. 300 Read #2 20.80 Read #3 20.85 Ave = 0.05
" #1 20.75 " #2 20.80
.05 .05
4.59 Acres

Frustrum of Pyramid $V = \frac{1}{3} h \left[b_1 + b_2 + \sqrt{b_1 b_2} \right]$

@ Elev 285 $V = \frac{1}{3}(24)\left[1.83 + 0 + \sqrt{1.83(0)}\right]$

$V = 14.64$

@ Elev 290 $V = \frac{1}{3}(5)\left[1.83 + 2.75 + \sqrt{1.83(2.75)}\right]$

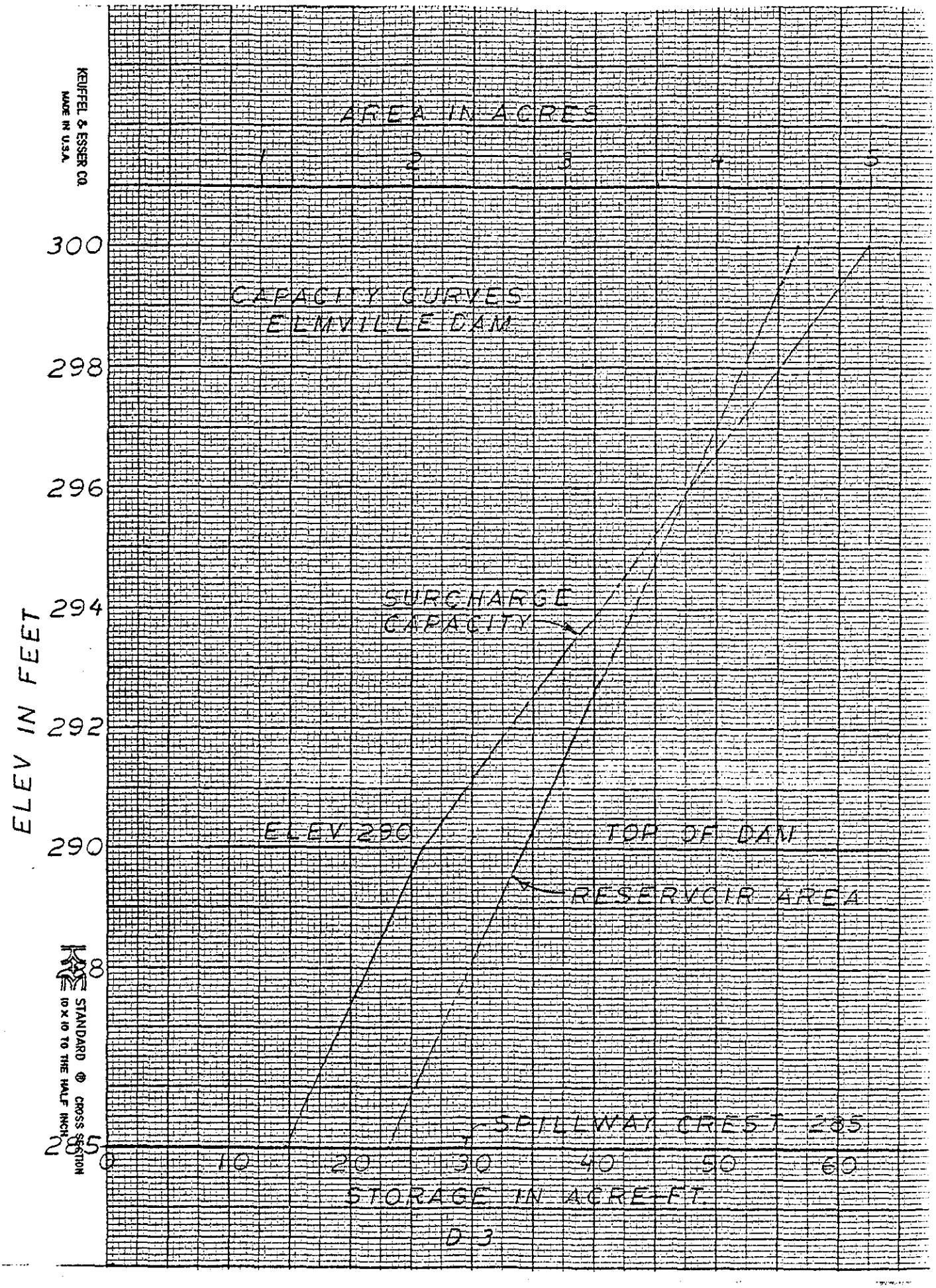
$\Delta V = 1.67 \left[6.82\right] = 11.39$

$V_{290} = 14.64 + 11.39 = 26.03$

@ Elev 300 $V = \frac{1}{3}(10)\left[2.75 + 4.59 + \sqrt{2.75(4.59)}\right]$

$V = 3.33 \left[10.89\right] = 36.26$

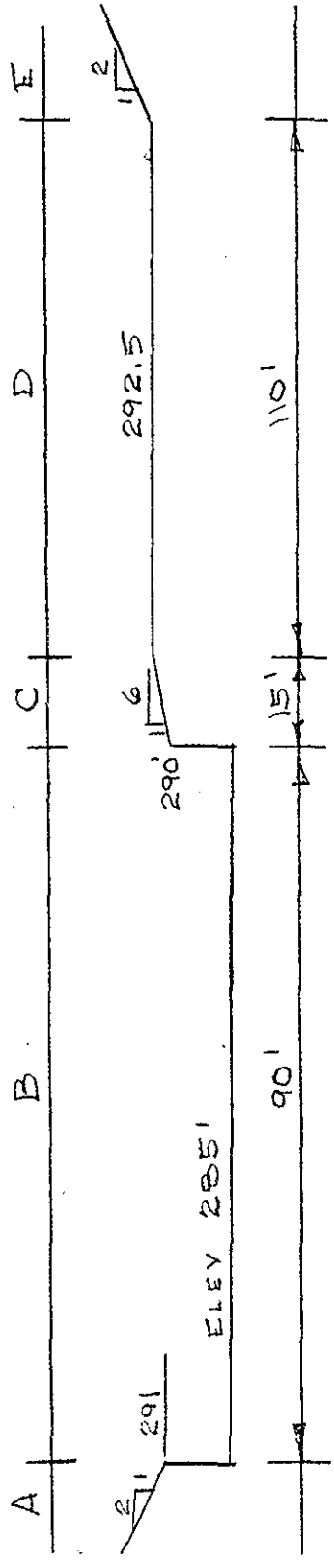
$V_{300} = 36.26 + 26.03 = 62.29$


KEUFFEL & ESSER CO.
MADE IN U.S.A.
AREA IN ACRES
1
2
3
4
5
CAPACITY CURVES
ELMVILLE DAM
ELEV IN FEET
300
298
296
294
292
290
288
286
SURCHARGE
CAPACITY
ELEV 290
TOP OF DAM
RESERVOIR AREA
SPILLWAY CREST 285
0
10
20
30
40
50
60
STORAGE IN ACRE-FT.
D 3
STANDARD @ CROSS SECTION
10 X 10 TO THE HALF INCH

BY RFB DATE 8-29-79 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. 1 OF

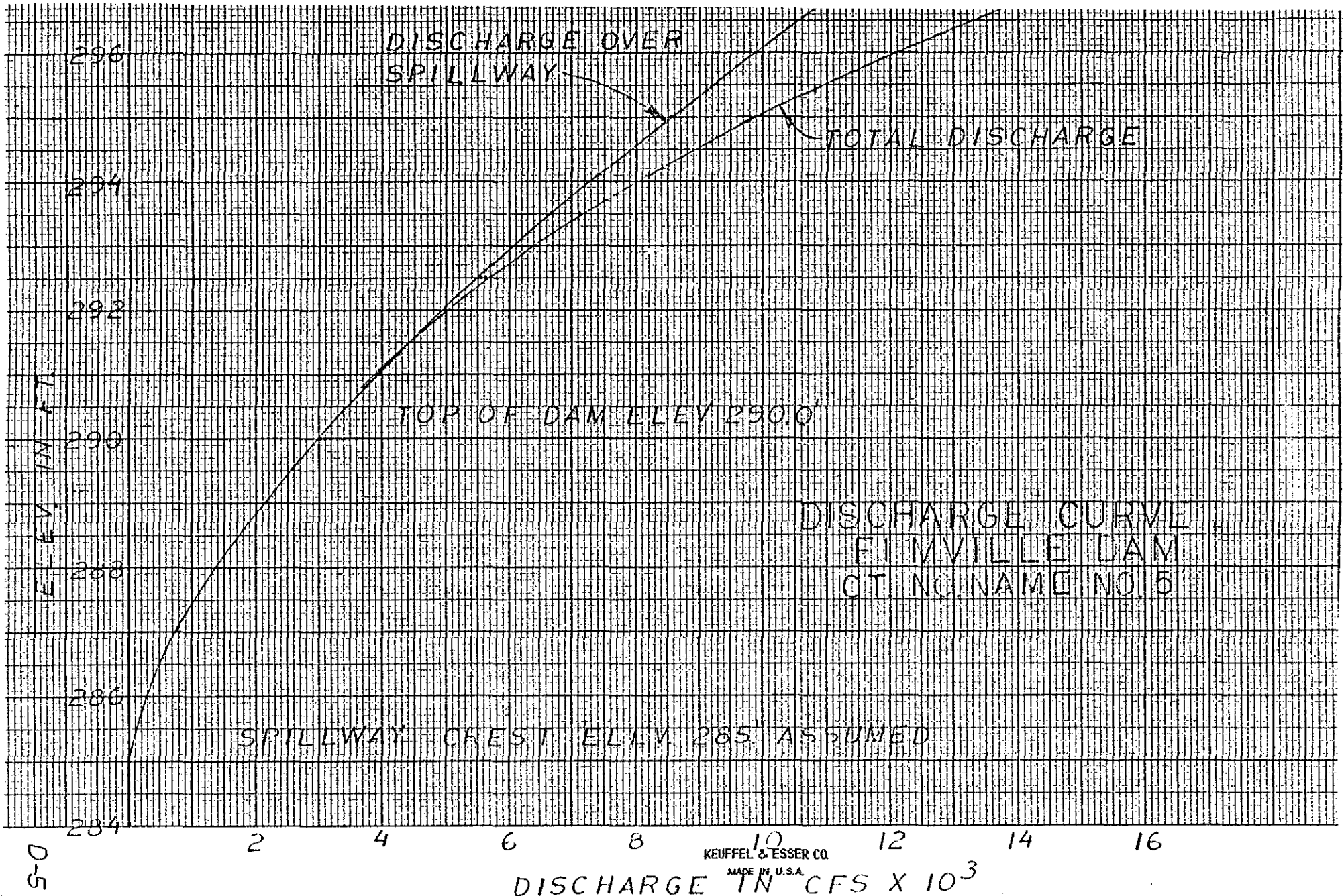
CHKD. BY DATE INSPECTION OF DAMS PROJECT

SUBJECT CT No Name, Elmville Dam, Capacity Curves



ELEV FT.	A, C = 2.8 L	A, C = 2.8 H	A, C = 2.8 Q	B, C = 3.0 L	B, C = 3.0 H	B, C = 3.0 Q	C, C = 2.9 L	C, C = 2.9 H	C, C = 2.9 Q	D, C = 2.7 L	D, C = 2.7 H	D, C = 2.7 Q
287	0	0	0	90	2	764	0	0	0	0	0	0
289	0	0	0		4	2160	0	0	0	0	0	0
290	0	0	0		5	3018	0	0	0	0	0	0
291	0	0	0		6	3968	0	.5	6	0	0	0
292.5	3	.75	6		7.5	5546	15	1.25	61	0	0	0
293.5	5	1.25	20		8.5	6691		1.75	101	110	1	297
295	8	2	63		10	8538		2.5	172		2.5	1174
297	16	3	233		12	11224		3.5	285		4.5	2825

ELEV FT	E, C = 2.7 L	E, C = 2.7 H	E, C = 2.7 Q	SQ
287	0	0	0	764
289	0	0	0	2160
290	0	0	0	3018
291	0	0	0	3974
292.5	0	0	0	5613
293.5	2	.5	2	7111
295	4	1.25	19	9966
297	7	2.25	82	14651


DISCHARGE OVER SPILLWAY
TOTAL DISCHARGE
TOP OF DAM ELEV 290.0'
SPILLWAY CREST ELEV 285 ASSUMED
DISCHARGE CURVE
ELMVILLE DAM
CT NO. NAME NO. 5
296
294
292
290
288
286
284
2
4
6
8
10
12
14
16
KEUFFEL & ESSER CO.
MADE IN U.S.A.
DISCHARGE IN CFS X 10-3

BY RFB DATE 8-30-79 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. 1 OF

CHKD. BY DATE INSPECTION OF DAMS PROJECT

SUBJECT CT No NAME No. 5, ELMVILLE, PMF CALCULATION

DRAINAGE AREA = 13.88 sq. mi

SIZE CLASSIFICATION = SMALL

HAZARD CLASSIFICATION = SIGNIFICANT

INSPECTION FLOOD = 100 YR TO ½ PMF

CALCULATE PMF USING "PRELIMINARY GUIDANCE FOR ESTIMATING MAXIMUM PROBABLE DISCHARGES IN PHASE I DAM SAFETY INVESTIGATIONS MARCH, 1978".

USE ROLLING TERRAIN CURVE

@ 13.88 sq mi PMF IN CFS/MI² = 1550

SAY PMF = 1550 (13.88) = 21,514

½ PMF = ½ (21,514) = 10,757

100 YR ≅ ¼ PMF = ¼ (21,514) = 5,378

BECAUSE OF UPSTREAM STORAGE & HAZARD CLASSIFICATION USE ½ PMF FREQUENCY.

SAY TEST FLOOD = ½ PMF = 10,800 CFS

BY RFB DATE 8-30-79 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. 1 OF

CHKD. BY DATE Inspection of Dams PROJECT

SUBJECT CT No Name #E, Elmville Dam, Failure Analysis

STEP 1 ASSUME FAILURE OCCURS WHEN STAGE IS AT TOP OF DAM: ELEV 290.0

@ ELEV 290 STORAGE = S = 26 ACRE-FT

STEP 2 DETERMINE Q_{p1}

$$Q_{p1} = 8/27\ W_b \sqrt{g}\ y_o^{3/2}$$

$y_o = 31$ FT

SAY W = WIDTH OF RIGHT ABUTMENT DIKE = 110'

$W_b = 40\%\ W = 0.40(110) = 44$ FT

$Q_{p1} = 1.68(44)(31)^{3/2}$

$Q_{p1} = 12{,}759$ CFS

Q OVER SPILLWAY = 3018 CFS

TOTAL $Q_{p1} = 12759 + 3018 = 15777$

SAY $Q_{p1} = 15{,}800$ CFS

SAY $Q_{SPILLWAY} = 3{,}000$ CFS

STEP 3 REACH 1 STA 0 TO 6+00

ELMVILLE DAM TO ROUTE 52, L = 600 FT

$Q = \frac{1.486}{n} AR^{2/3} S^{1/2}$, $n = 0.045$, $S = 1.2\%$

$S = 0.012$

$S^{1/2} = .109$

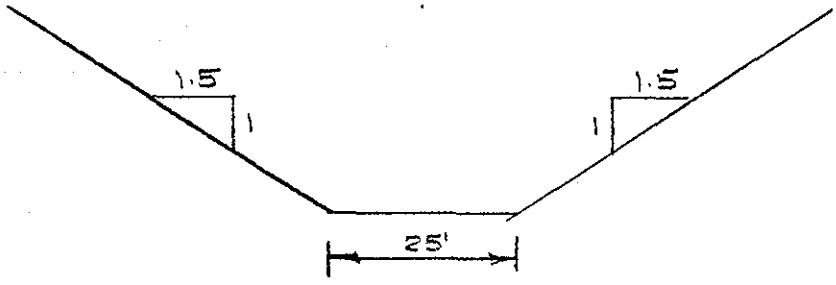
$Q = 3.62\ AR^{2/3}$

BY RFB DATE 9-20-79 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. 2 OF

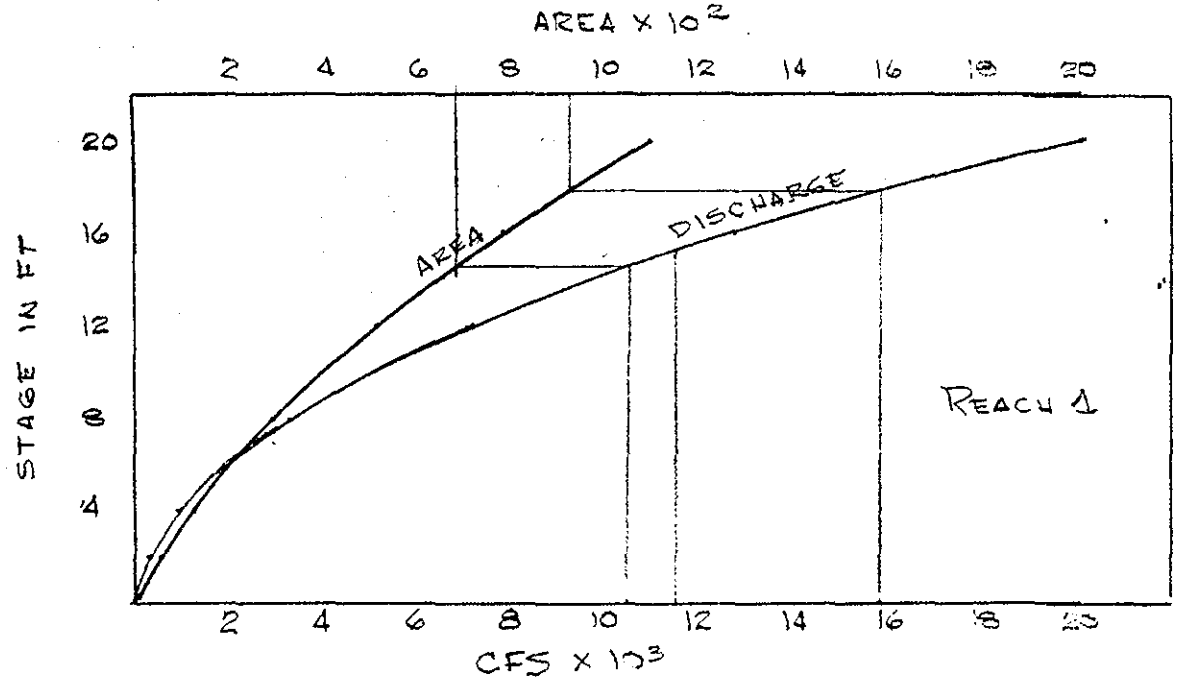
CHKD. BY DATE INSPECTION OF DAMS PROJECT

SUBJECT CT NO NAME #5, ELMVILLE DAM FAILURE ANALYSIS

REACH # 1



H	Δ AREA	Σ AREA	WP	R	$2^{2/3}$	Q
2	62	56	32.2	1.74	1.44	292
4		124	39.4	3.15	2.15	965
8		296	53.8	5.50	3.12	3343
12		516	68.2	7.57	3.86	7210
16		784	82.6	9.49	4.49	12743
20		1100	97.0	11.34	5.05	20109
24		1464	111.4	13.14	5.57	
28		1876	125.8	14.91	6.06	



REACH #1, L = 600, STORAGE @ FAILURE = 26 ACRE-FT

STORAGE AREA @ SPILLWAY Q IS 300 FT²

" VOLUME @ " " = $\frac{300 \times 600}{43,560}$ = 4.13 ACRE/FT

STEP 4 FOR Q_{P_1} = 15,800, STAGE = 17.8, AREA = 930

V = 12.81 V_1 = 12.81 − 4.13 = 8.68

Q_{P_2} (TRIAL) = $15,800 \left(1 - \frac{8.68}{26}\right) = 15,800 \left(1 - .334\right)$

Q_{P_2} (TRIAL) = 10,523, STAGE = 14.6, AREA = 685

V = 9.44 V_2 = 9.44 − 4.13 = 5.31

$V_{AVE} = \frac{8.68 + 5.31}{2} = 7.0$

$Q_{P_2} = 15,800 \left(1 - \frac{7.0}{26}\right) = 15,800 \left(1 - .269\right)$

Q_{P_2} = 11,550, STAGE = 15.3 FT

FOR Q = 3000, STAGE = 7.6 FT

ΔH = 7.7 FT

STEP 3, REACH 2, STA 6+00 + 11+00

ROUTE 52 TO ROUTE 12 L = 500

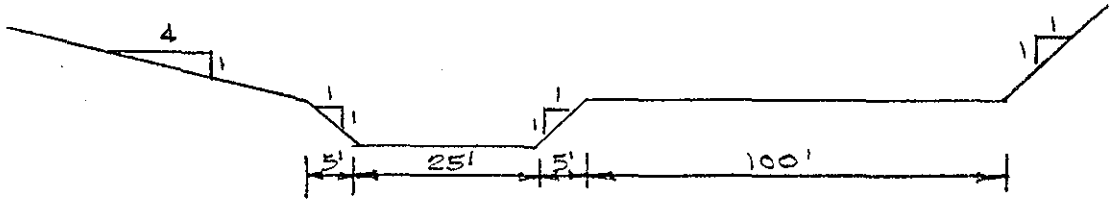
$Q = \frac{1.486}{n} A R^{2/3} S^{1/2}$ n = .050, S = 1.2%

S = 0.012

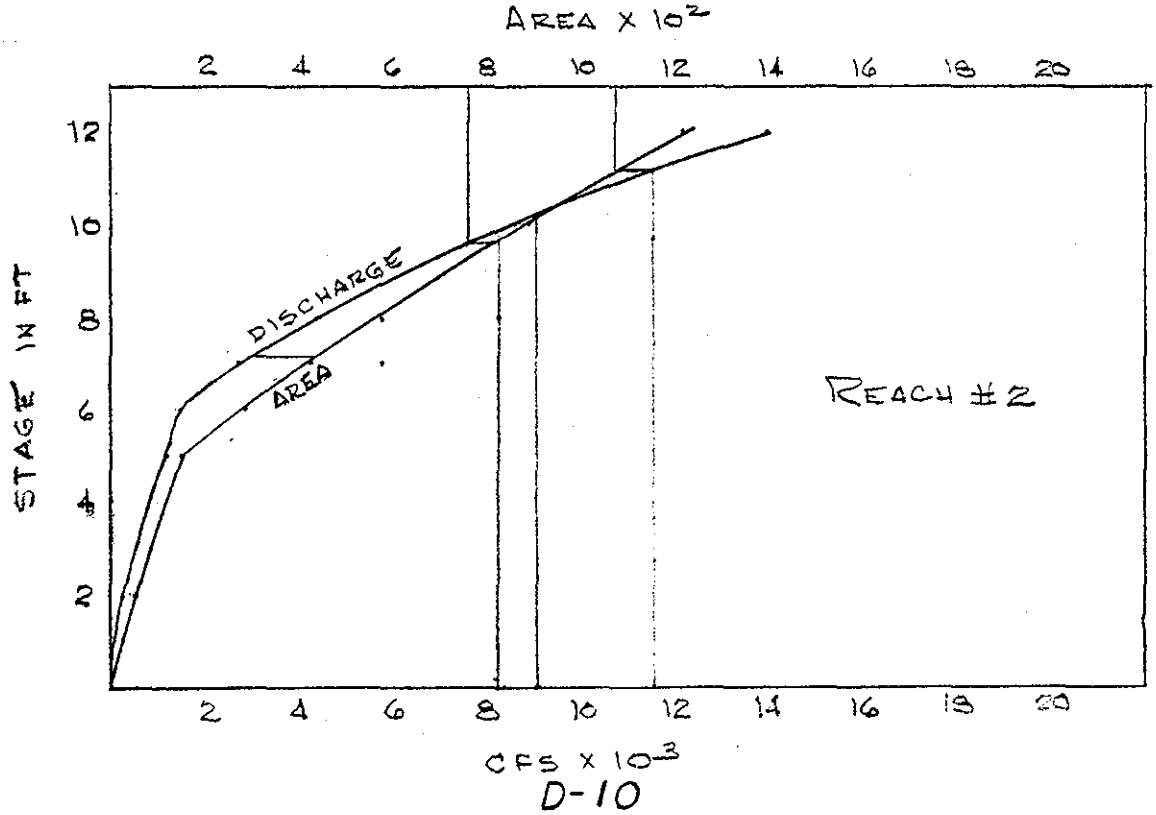
$S^{1/2}$ = .1095

$Q = 3.25 A R^{2/3}$

REACH #2



H	Δ AREA	Σ AREA	WP	R	$R^{2/3}$	Q
2	54	54	30.6	1.76	1.46	256
5	96	150	39.2	3.83	2.45	1194
6	138	288	144.7	1.99	1.58	1479
7	140	428	154.4	2.77	1.97	2740
8	150	578	164.1	3.52	2.31	4339
10	310	888	173.8	5.11	2.97	8571
12	330	1218	183.5	6.64	3.53	13973



Reach #2, L = 500, Storage @ Failure = 26 acre-ft

Storage area at spillway Q is 420 ft²
" volume " " " is 4.94 acre-ft

Step 4 For Q_{p_1} = 11,550, Stage = 11.2, Area = 1080

V = 12.40 V_1 = 12.4 − 4.94 = 7.46

Q_{p_2} (trial) = $11{,}550\left(1-\frac{7.46}{26}\right)$ = $11{,}550\,(1-.287)$

Q_{p_2} (trial) = 8235, Stage = 9.6, Area = 760

V = 8.72 V_2 = 8.72 − 4.94 = 3.78

$V_{AVE} = \frac{7.46+3.78}{2}$ = 5.62 acre-ft

$Q_{p_2} = 11{,}550\left(1-\frac{5.62}{26}\right) = 11{,}550\,(1-.216)$

Q_{p_2} = 9055, Stage = 10.1 ft
For Q = 3000, Stage, = 7.2 ft
ΔH = 2.9 ft

Step 3, Reach 3, Sta 11+00 to 19+00

Route 12 to CEM Building, L = 800

$Q = \frac{1.486}{n} A R^{2/3} S^{1/2}$ n = 0.050, S = 0.8%

S = 0.008

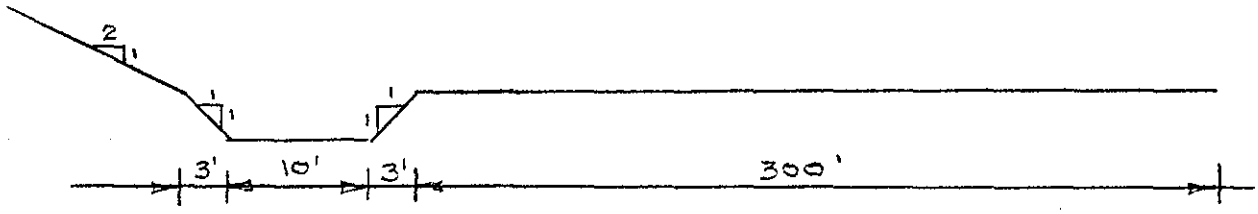
$S^{1/2}$ = .089

$Q = 2.65 A R^{2/3}$

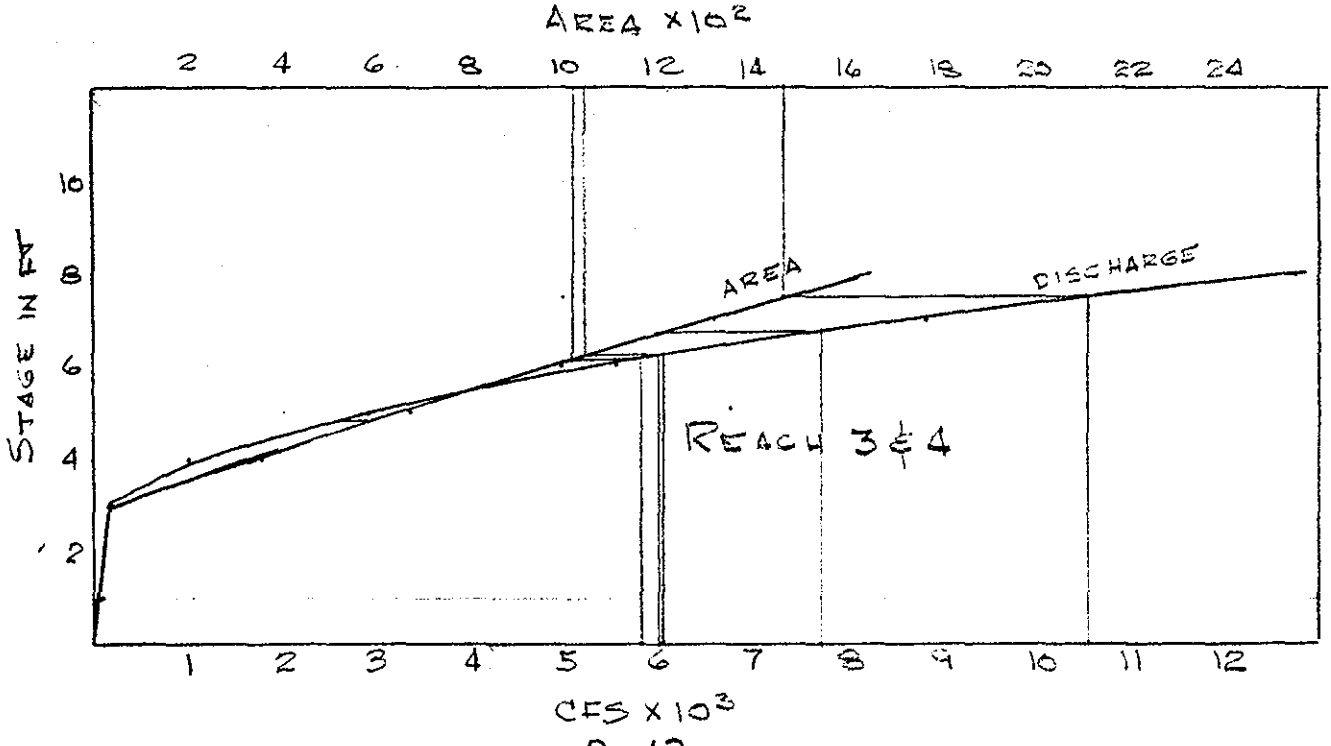
BY RFB DATE 8-31-79 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. 6 OF

CHKD. BY DATE INSPECTION OF DAMS PROJECT

SUBJECT CT NO NAME #5, ELMVILLE DAM, FAILURE ANALYSIS



H	Δ AREA	Σ AREA	WP	R	$R^{2/3}$	Q
1	11	11	11.4	.99	.99	29
3	28	39	18.5	2.11	1.65	170
4	317	356	320.7	1.11	1.07	1009
5	319	675	322.2	2.09	1.64	2934
6	321	996	324.4	3.07	2.11	5570
7	323	1319	326.6	4.04	2.54	8378
8	325	1644	328.8	5.00	2.93	12765



D-12

REACH #3, L = 800, STORAGE @ FAILURE = 26 ACRE-FT

STORAGE AREA AT SPILLWAY Q IS 520 FT²
" VOLUME " " " IS 9.55 ACRE-FT

STEP 4 FOR Q_{P1} = 9055, STAGE = 7.5', AREA = 1470

V = 26.9 V_1 = 26.9 - 9.55 = 17.35 > ½ S
USE SHORTER REACH

SAY L = 400',

STORAGE VOLUME = 9.55/2 = 4.78 ACRE-FT

STEP 4 FROM ABOVE V = 26.9/2 = 13.45 ACRE FT

V_1 = 13.45 - 4.78 = 8.67

$$Q_{(TRIAL)} = 9055\left(1 - \frac{8.67}{26}\right) = 9055(1 - .333)$$

Q_{P2} (TRIAL) = 6040 CFS

Q_{P2} = 6040, STAGE = 6.2, AREA 1040, V = 9.55

V_2 = 9.55 - 4.78 = 4.77

V_{AVE} = 8.67 - 4.77 = 3.9

$$Q_{P2} = 9055\left(1 - \frac{3.9}{26}\right) = 9055(1 - 0.15)$$

Q_{P2} = 7696 CFS, STAGE = 6.8

FOR Q = 3000, STAGE = 4.8

ΔH = 2.0 FT

REACH # 4, L = 400, STORAGE @ FAILURE = 26 ACRE-FT

STORAGE VOLUME AT SPILLWAY Q IS 4.78 ACRE-FT,

FOR Q = 7696, STAGE 6.8, AREA = 1220

$V = 11.20$ $V_1 = 11.20 - 4.78 = 6.42$ ACRE-FT,

Q_{P2} (TRIAL) $= 7696\left(1 - \frac{6.42}{26}\right) = 7696\,(1 - .247)$

$Q_{P2} = 5795$, STAGE = 6.1, AREA = 1020

$V = 9.37$ $V_2 = 9.37 - 4.78 = 4.59$ ACRE-FT

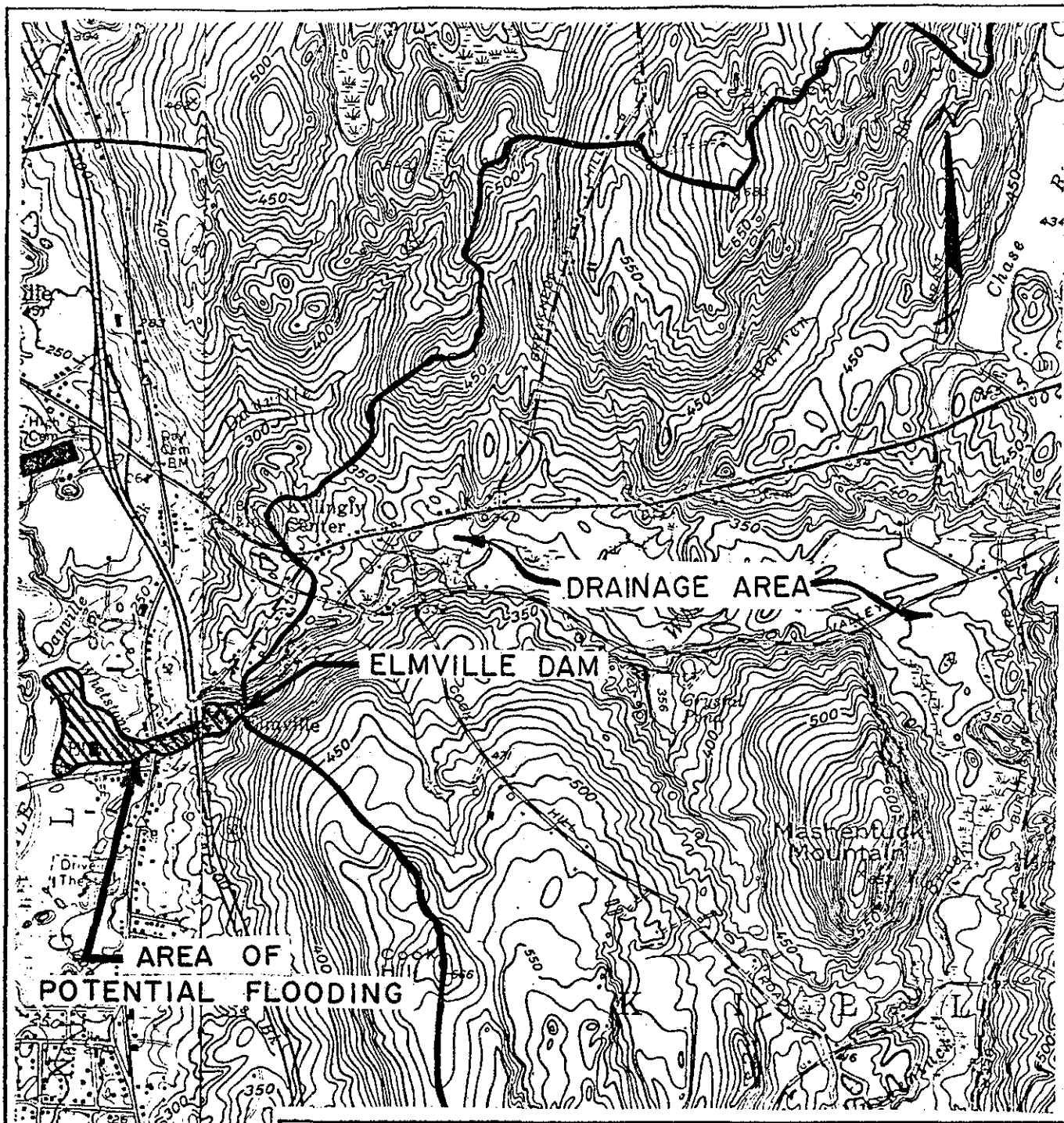
$$V_{AVE} = \frac{6.42 + 4.59}{2} = 5.51$$

$$Q_{P2} = 7696\left(1 - \frac{5.51}{26}\right) = 7696\,(1 - .212)$$

$Q_{P2} = 6065$, STAGE = 6.3

FOR Q = 3000, STAGE = 4.8

$\Delta H = 1.5$ FT



LOUIS BERGER & ASSOC., INC WELLESLEY, MASS. ARCHITECT · ENGINEER	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.

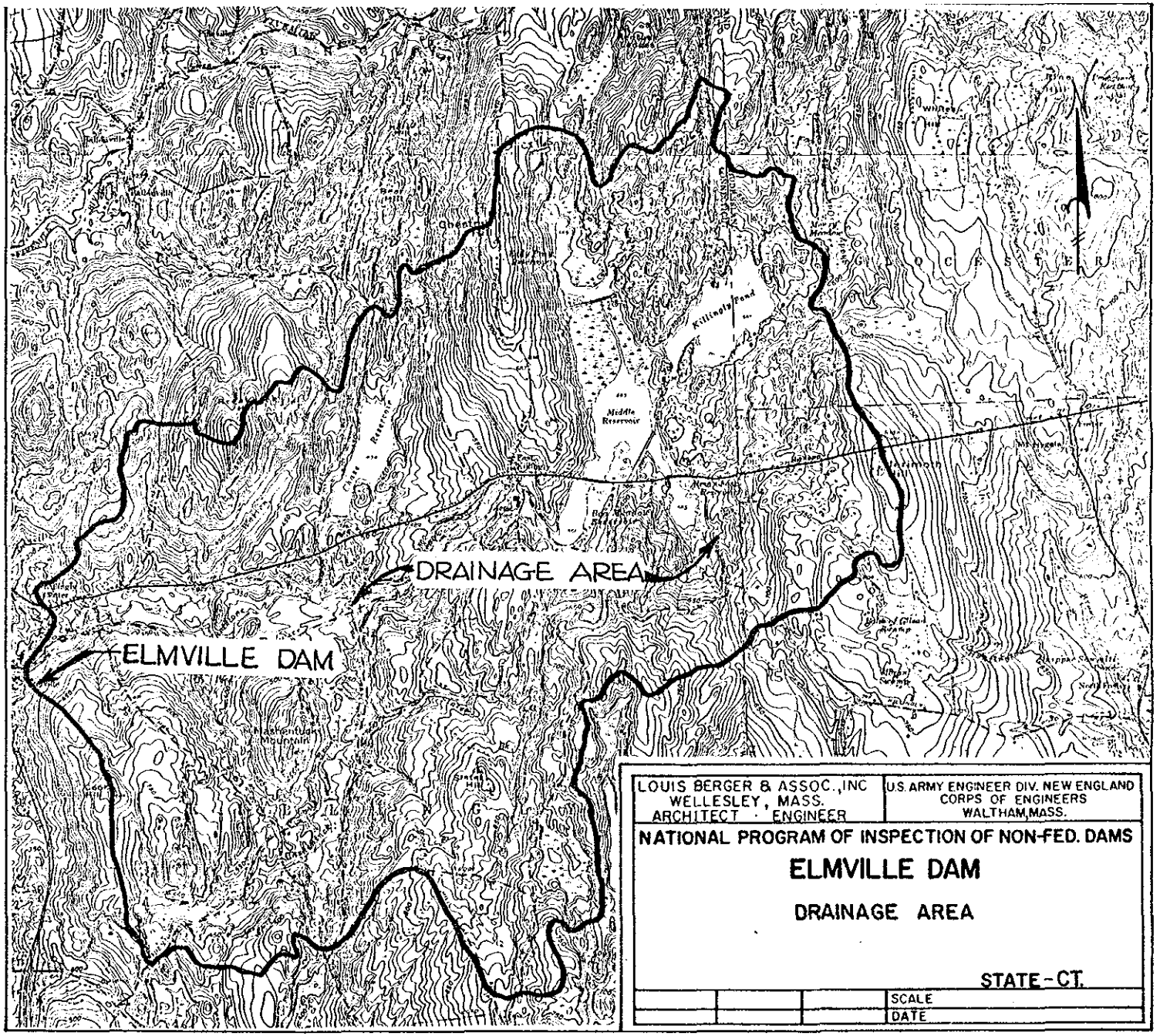
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

ELMVILLE DAM

DRAINAGE AREA AND AREA OF POTENTIAL FLOODING

STATE - CT.

			SCALE 1:24000
			DATE



LOUIS BERGER & ASSOC., INC WELLESLEY, MASS. ARCHITECT · ENGINEER	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

ELMVILLE DAM

DRAINAGE AREA

STATE - CT.

			SCALE
			DATE

APPENDIX E

INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS

INVENTORY OF DAMS IN THE UNITED STATES

(1) STATE	(2) IDENTITY NUMBER	(3) DIVISION	(4) STATE	(5) COUNTY	(6) CONGR DIST.	(7) STATE	(8) COUNTY	(9) CONGR DIST.	(10) NAME	(11) LATITUDE (NORTH)	(12) LONGITUDE (WEST)	(13) REPORT DATE DAY	MO	YR
CT	165	NED	CT	015					ELMVILLE DAM	4149.9	7152.9	21	AUG	79

(14) POPULAR NAME	(15) NAME OF IMPOUNDMENT
	WHETSTONE BROOK

(16) REGION	(17) BASIN	(18) RIVER OR STREAM	(19) NEAREST DOWNSTREAM CITY–TOWN–VILLAGE	(20) DIST FROM DAM (MI.)	(21) POPULATION
01	07	WHETSTONE BROOK	ELMVILLE	0	600

(22) TYPE OF DAM	(23) YEAR COMPLETED	(24) PURPOSES	(25) STRUCTURAL HEIGHT (FT.)	(26) HYDRAULIC HEIGHT (FT.)	(27) IMPOUNDING CAPACITIES MAXIMUM (ACRE–FT.)	NORMAL (ACRE–FT.)	DIST	OWN	FED R	PRV/FED	SCS A	VER/DATE
REPCOT	1900	0	32	31	20	15	NED	N	N	N	N	

(28) REMARKS
21-STONE OVERFLOW 23-FORMERLY INDUSTRIAL STORAGE

(29) D/S HAS	(30) SPILLWAY CREST LENGTH	(31) SPILLWAY TYPE	(32) SPILLWAY WIDTH (FT.)	(33) MAXIMUM DISCHARGE (FT.)	(34) VOLUME OF DAM (CY)	(35) POWER CAPACITY INSTALLED (MW)	(36) POWER CAPACITY PROPOSED (MW)	(37) NAVIGATION LOCKS NO.	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)
2	200	U	90	3000	14000											

(38) OWNER	(39) ENGINEERING BY	(40) CONSTRUCTION BY
MORRIS FISHER + SONS		

(41) REGULATORY AGENCY			
DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE
NONE	NONE	NONE	NONE

(42) INSPECTION BY	(43) INSPECTION DATE DAY	MO	YR	(44) AUTHORITY FOR INSPECTION
LOUIS BERGER ASSOCIATES, INC	21	AUG	79	PL92-367

(45) REMARKS